Arab Republic of Egypt
Ministry of education
The Book Sector

# Explore and Learn

# Science

## For
## Preparatory Stage - Year 1

### First Term

2016 - 2017

غير مصرح بتداول هذا الكتاب
خارج وزارة التربية والتعليم

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# المقدمة

## عزيزى التلميذ/ التلميذة

يسعدنا ونحن نقدم هذا المنهج لأبنائنا تلاميذ الصف الأول الإعدادى أن نؤكد على أن تعلم العلوم متعة وبهجة، متعة فى القيام ببعض الأنشطة العلمية البسيطة، وبهجة فيما يمكن الوصول إليه من نتائج فتعلم العلوم يعتمد على الملاحظة والتفكير والتجربة واستخلاص النتائج

وقد تم اختيار عنوان لهذا المنهج يعكس فلسفته؛ وهو **اكتشف وتعلم** وقد شارك فى إعداد هذا المنهج مجموعة من المتخصصين فى المناهج وطرق تدريس العلوم والخبراء والموجهين والمعلمين، كما تم فيه تجربة الاستعانة بمجموعة من تلاميذ المرحلة المستهدفة تأكيدًا لفلسفة المنهج من حيث مراعاة طبيعة المرحلة العمرية وطبيعة المعرفة والمجتمع

ويهدف هذا الكتاب إلى مساعدة التلميذ على إدراك العلاقة بين العلم والتكنولوجيا ورؤية العلم من منظور شخصى ومجتمعى وفهم تاريخ وطبيعة العلم وتنمية مهارات التفكير العليا وامتلاك المفاهيم العلمية الأساسية ولتحقيق هذه الأهداف تم استخدام أسلوب علمى تقدم فيه المفاهيم فى شكل وحدات دراسية فى ترابط منطقى بعضها مع البعض وتكامل مع المواد الدراسية الأخرى كما أن الموضوعات المتضمنة فى هذا المنهج تتناول المفاهيم الرئيسية فى مجالات المادة وتركيبها، والطاقة، والتنوع والتكيف فى الكائنات الحية، والتفاعلات الكيميائية، والقوى والحركة، والأرض والكون؛ مما يساعد على تشجيع البحث والاستقصاء العلمى

ويتضمن **الفصل الدراسى الأول** ثلاث وحدات لكل منها عنوان يدل على محتواها فقد جاءت **الوحدة الأولى** بعنوان المادة وتركيبها **والوحدة الثانية** بعنوان الطاقة، **والوحدة الثالثة** بعنوان التنوع والتكيف فى الكائنات الحية وتشمل كل وحدة مجموعة دروس مترابطة ومتكاملة

ويعتمد المنهج على إثارة رغبة التلاميذ والتلميذات فى المعرفة والتعلم، والاستفادة من الخبرات المحيطة بهم من كل جانب وذلك من خلال الاعتماد على الأنشطة والتدريبات المتنوعة كما يعتمد المنهج على استراتيجيات التعلم النشط والتعليم المتمركز حول المتعلم فى تنفيذ دروسه؛ ولذلك تم تزويد الدروس بمصادر المعرفة ووسائل التكنولوجيا الحديثة بما يشجع مهارات البحث والتعلم الذاتى وتنمية مهارات التفكير الناقد ويساعد التلميذ على التأمل والتقييم الذاتى فيما يدرسه ويتعلمه، وتكوين ملف الإنجاز الخاص به بما يتفق وفلسفة التقويم الشامل

ونحن إذ نقدم هذا الكتاب نرجو الله أن يحقق الفائدة منه

**والله ولى التوفيق**

**المؤلفون**

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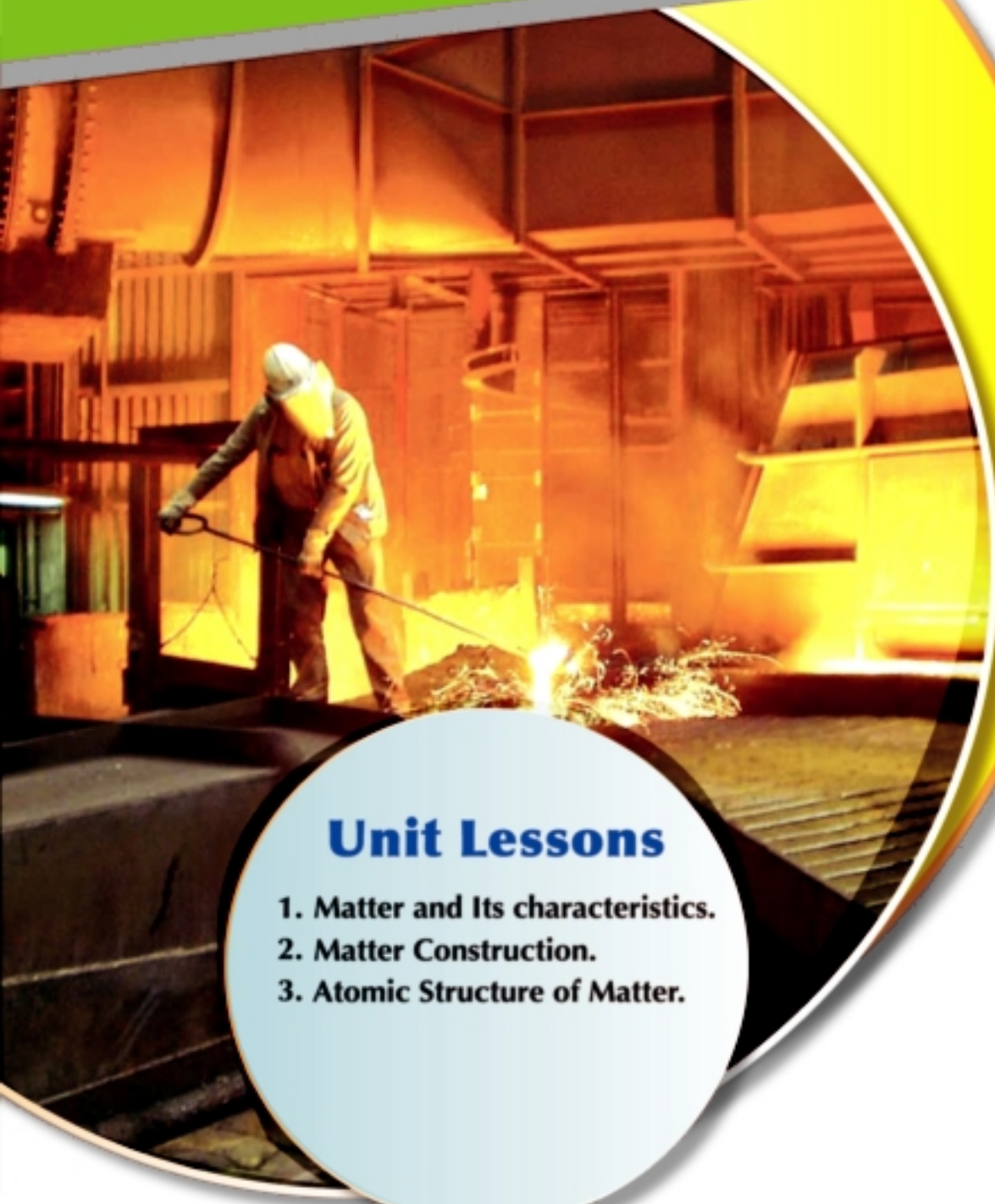
# Unit One

## Matter and its Construction

- Matter and its characteristics.
- Atomic construction of matter.



### Unit Lessons

1. Matter and Its characteristics.
2. Matter Construction.
3. Atomic Structure of Matter.

# Objectives

**By the end of this unit, a student will be able to:**

1. Identify the physical and chemical properties of matter.
2. Classify a group of materials according to their physical and chemical properties.
3. Appreciate the importance of senses in identifying the physical properties of matter.
4. Prove by an activity that mass of matter still constant if it is divided or changed from one state to another.
5. Prove by an activity the properties of molecules.
6. Identify the concept of the element and the compound.
7. Compare the molecule of an element to the molecule of a compound according to the atomic structure.
8. Identify the concept of an atom and its structure.
9. Design a model for the atom to show its structure.
10. Conclude the relation between the atomic structure and the chemical properties of the atom.
11. Design some models for the structure of molecules of some materials.
12. Identify the electronic configuration in an atom.
13. Design a model for an electronic configuration of an atom.
14. Mention the symbols and chemical formula of some materials.
15. Conclude the fact that an atom is the building unit of all materials.
16. Appreciate the glory of God in creating a countless number of different materials.
17. Appreciate the role of scientists and their scientific discoveries in the field of the matter structure.

# Matter and Its characteristics

# Lesson One

## Lesson Items

1. Physical properties of matter.
2. Metals and chemical activity.

## Lesson Objectives

**By the end of this lesson, a student will be able to:**

- Conclude that materials of densities lighter than water density float over water surface.
- Explain the concept of density.
- Determine a liquid density.
- Illustrate life applications of density.
- Explain points of melting and boiling.
- Give examples for conductors and non conductors of electricity.
- Give examples for conductors and non conductors of heat.
- Compare solidification among different materials.
- Understand money loss from the rusting process.
- Explain methods of metal protection against metal corrosion.

## Life Issues

- Economize consumption of resources.

# Matter and its characteristics

Matter is surrounding us everywhere. It is everything that has mass and volume (occupies space.)

**Attention**
- Some substances may harm you when testing them by either taste or smell. Ask your teacher first.

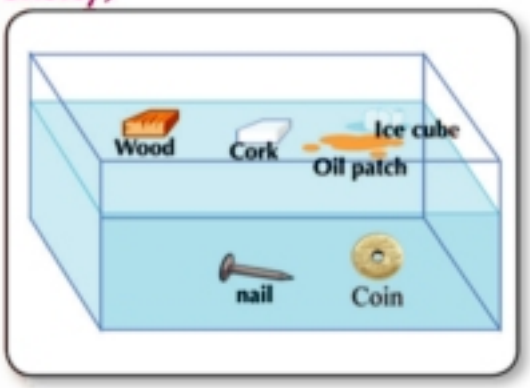
Substances differ in some of their characteristics such as colour, taste and smell. A substance may differ than another in its colour, its taste, its smell or even in all of these characteristics. For example, colour enables us distinguishing among iron, gold and silver. Also the taste enables us distinguishing between sugar and table salt, and at last, smell enables us distinguishing between perfume and vinegar.

There are also some other substances have no colour, no smell or no taste. Such as water and oxygen gas. These substances can be distinguished from each others by other different characteristics.

## Activity 1 (Matter and Density)

Put the following substances in a bowl filled with water as shown:

A Coin ,an iron nail , an ice cube, a piece of wood, a piece of cork and drops of food oil. Record your observations.




- What do you observe: .....
- Conclusion: .....

Substances of densities less than the water density, float on water surface, while other substances of densities more than that of water sink.

- Equal masses of different substances have different volumes ,also the equal volumes of different substances have different masses. This is because of their different densities.

Density: it is the mass of unit volume of a substance (mass of one cubic centimeter 1 $cm^3$).

So density is related to an object mass and to its volume as well:

$$\text{Density } (g/cm^3) = \frac{\text{Mass (g)}}{\text{Volume } (cm^3)}$$

**Example:** on finding a liquid density through an experiment, the following results were recorded:

Mass of an empty glass beaker = 75 g

Mass of the beaker containing liquid = 135 g

Volume of the liquid measured by a graduated cylinder = 100 $cm^3$

So we can calculate the liquid density as follows:

Mass of liquid = 135 - 75 = 60 g.

$$\text{Liquid Density} = \frac{\text{Mass}}{\text{Volume}}$$

Liquid Density = 60 ÷ 100 = 0.6 $g/cm^3$

**Exercise** The following table records values of masses and volumes of some substances.

- Arrange the substances according to density descendingly:

| Substance | Mass (g) | Volume $cm^3$ | Density ($g/cm^3$) |
|---|---|---|---|
| Water | 50 | 50 | |
| Iron | 31.2 | 4 | |
| Petrol oil | 82 | 100 | |
| red copper | 22.25 | 2.5 | |
| cork | 5 | 25 | |

- Densities in descending order: .....

Life Applications

1. Water is not used in extinguishing petrol fires because petroleum oil floats over water surface .

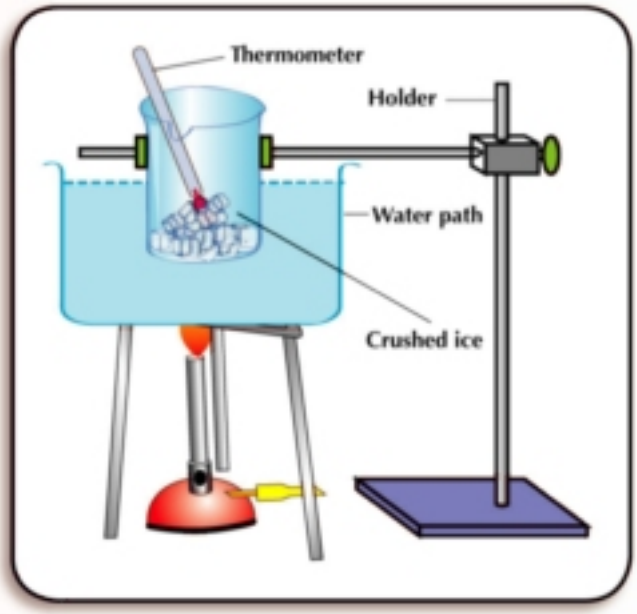
2. Balloons filled with hydrogen or helium rise upwards carrying flags during festivals since their densities are lighter than that of air..

Exercise

Knowing the density of natural milk is 1.03 g/cm$^3$. How can you identify the quality of milk you bought from a milk vendor?

## Activity 2 Matter and point of fusion

- In the opposite figure there is a water bath.
- Put some crushed ice in the internal beaker, and a thermometer.
- Place the water bath on a flame and wait some time.
- When ice begins to melt, place the flame away, record the thermometer reading.
- Repeat the procedure using solid wax instead of ice, then record the thermometer reading when wax begins to melt. Is the melting point of wax the same as that of ice?




- What do you observe? .....
- Conclusion: .....

Melting point: it is the temperature at which matter begins to change from a solid state into a liquid one.

Melting points of substances differ from each other, some have low melting points like butter, ice and wax, others have higher melting points like iron, aluminum, copper and table salt.

## Life Applications

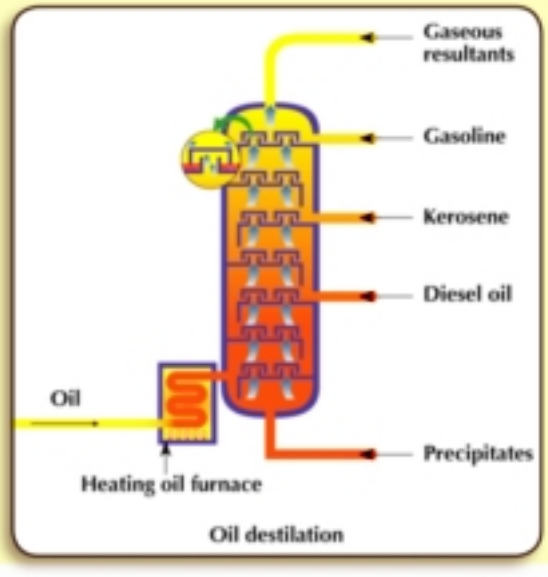
1. Manufacturers heat metals to be molten, so that they could be easily shaped or even mixed to form alloys Like gold copper alloy used in making jewels, or nickel chrome alloy which is used in making heating coils.
2. Cooking pots are made up of aluminum or stainless steel alloy which does not rust, due to its high melting point .

- Also each substance has its own boiling point which identifies this substance and distinguishes it from other substances.

Boiling point: it is the temperature at which a substance begins to change from a liquid state into a gaseous state.

## Enrichment information

- Scientists depend on the variations of boiling points of substances to separate the petrol components by heating the oil to separate each substance at its boiling point.
- The boiling point is the temperature at which the vapour pressure of the substance equals the atmospheric pressure so the boiling point of a liquid increases by the increase of the pressure exerted on.
- Pressure cooking pots are used to save time taken to cook food. Because these pots cause the increase of pressure, so the boiling point increases.



Oil destilation

There are other characteristics of which other substances are different such as hardness, electric conduction and thermal conduction:

### Hardness:

- Some solids are soft at ordinary temperatures such as rubber.
- Some substances need heat to get soften in order that to be easily shaped such as metals.
- Some other substances are solids which can not be soften if heated such as coal and sulphur.

### Electric conduction:

- Some substances are good electric conductors such as metals (copper and silver) also acid and alkali solutions and some salts solutions.
- Some other substances do not conduct electricity such as gases, sugar solution, or solution of hydrogen chloride in benzene. In addition to some other solid elements such as sulphur and phosphorus.

### Thermal conduction:

Substances differ in their abilities of heat conduction.. Some are poor thermal conductors like wood and plastics. Other substances are good heat conductors like metals (iron – copper – aluminum ….).

### Life Applications

1. Electric cables are made up of copper or aluminum.
2. Cooking pots are made up of aluminum.
3. Cooking pots have handles made up of wood or plastic.
4. The handles of screw drivers are made up of plastics or wood while the rest of the screw drivers are made of steel iron.

### Metals and chemical activity:

Why do metals lose their luster when they are exposed to air for a period of time?

Some elements are very active as potassium and sodium which react with oxygen as soon as being exposed to humid air. Other substances like iron, aluminum and copper react with oxygen if left in air for some days since they have less chemical activity.

Some other substances find great difficulty to react with oxygen like silver, platinum and gold since they are not active; so these substances are used in making jewels. Also substances, like gold and silver, which are chemically poor active are used to cover other substances which rapidly gain rust, as iron to protect them from corrosion.

### Life Applications

1. Painting metallic bridges and the light posts in streets from time to time in order to protect them against rust.
2. Spare parts of cars are coated with grease to protect them getting rust.
3. Cooking aluminum pots are washed using a rough material to remove any layer formed on the pot surface.

### Optional Activities:

Choose one of the following activities, share a group of classmates to perform, then ask your teacher to evaluate.

1. Write a list of some substances then compare their characteristics.
2. Write a report about life applications of some substances
3. Write a scientific essay about the negative impact of iron rust which causes economic loss and how to overcome.?

## Summary

- Density: mass of unit volume of a substance
- Melting point: it is the temperature at which a substance changes from a solid state into a liquid one.
- Boiling point: it is the temperature at which a substance changes from a liquid state into gaseous one.
- Substances differ in their characteristics as: colour, taste, smell, density, melting and boiling points, hardness, thermal conduction, and electric conduction.
- Substances have different chemical activities.

# Exercises

## Question 1:

**Complete the following:**

1. Unit of volume is..... and that of mass is .....
2. Density is the ..... of unit volume of the substance and its unit is .....
3. An alloy of ..... is used in making jewels while an alloy of ..... is used in making heaters coils.
4. Light posts in streets are painted from time to time in order to protect from .....
5. Substances conduct heat and electricity are like ..... and ..... while substances which do not conduct neither heat nor electricity are like ..... and .....

## Question 2:

**Explain the following observations:**

1. Wood piece floats in water surface while a piece of lead sinks.
2. Iron rods, not copper, are used in building houses concrete.
3. Ice cube changes into a liquid water after a period of time.
4. Electrician uses a screw driver made up of steel iron with a woody handle.

## Question 3:

A. On determining iron density using a piece of iron of mass 78 g. The piece is immersed in 100 $cm^3$ of water, the water increases up to 110 $cm^3$ .Calculate iron density.

B. **What is meant by:**
Melting point – Boiling point.

## Question 4:

A. **Select the best answer:**

1. The colour property is a distinguishing factor between:
   (Flour and table salt – iron and gold – oxygen and carbon dioxide).
2. The smell property is a distinguishing factor between:
   (Iron and copper – wood and plastic – perfume and vinegar).
3. The taste property is a distinguishing factor between:
   (Milk and honey – wood and plastic – silver and gold).
4. The property of electric conduction is a distinguishing factor between:
   (Iron and copper – wood and plastic – iron and wood).

B. One of your classmates has bought a medal of silver, he thought it was fake. How can you help him to verify this thought?

## Self reflection and self evaluation

Dear student, as you finish the study of matter and its characteristics try to fill in this card:

A. What are the issues you like in the lesson?

.....

B. What are the issues you dislike in the lesson?

.....

C. What are the errors you have done on doing the experiments and performing activities?

.....

D. What are the errors can be avoided in the next activities?

.....

# Matter Construction

# Lesson Two

## Lesson Items

1. The molecule.
2. Molecule structure.

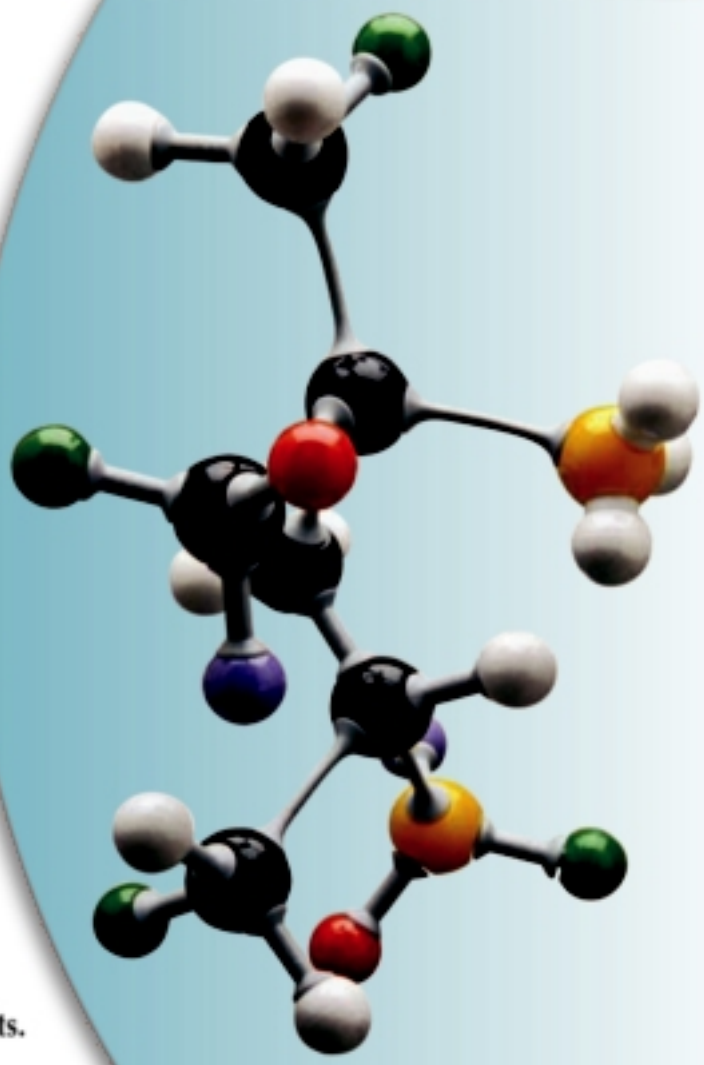
## Lesson Objectives

**By the end of this lesson, a student will be able to:**

- Identify the building unit of matter.
- Prove by experiment that molecules of matter are in contineous motion.
- Indicate by experiment that there are intermolecular spaces between molecules.
- Compare between the three states of matter according to the attraction forces among molecules.
- Explain the relation between the temperature and the attraction forces among molecules.
- Define the meaning of an element and a compound.
- Give some examples of elements and compounds as well.
- Design preliminary models for elements and compounds molecules.
- Show the economic benefits of some elements.

## Life Issues

- Investing resources.



The living organism consists of a group of organs and each organ is composed of a number of cells …thus the cell is the structural unit of the living organism. The matter is formed of very small structural units known as molecules.

What is a molecule? .....

## Activity 1 (Matter is composed of molecules)

1. Put some perfume in a glass bottle and measure its mass, using a sensitive balance.
2. Open the bottle for a period of time, then take it to another side of the classroom.

- What do you observe? .....
- Conclusion: .....

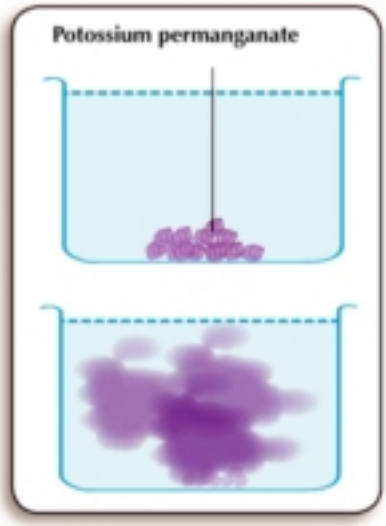
3. Measure the mass of the bottle again.

- What do you observe? .....
- Conclusion: .....

The perfume particles are divided into tiny particles that can not be seen via naked eye nor even by a microscope, these particles are spread and carried through the air in the room having the perfume properties. These particles are called molecules.

Molecule: is the smallest particle of a matter which can be existed freely and it has its own matter properties.

Try these activities to identify the properties of molecules in a substance:




## Activity 2 Motion of molecules

1. Put a small amount of potassium permanganate in a glass beaker containing water.
2. Leave the beaker a period of time.

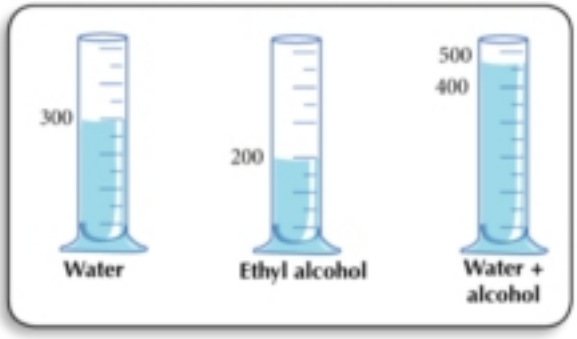
- What do you observe? .....
- Conclusion: .....

Permanganate salt is dissociated into particles and spread in the water gradually in all directions until all the water has been coloured in violet, and this proves that permanganate particles are in continuous motion allowing them to spread among water molecules. Additionaly, observe the perfume molecules spread in the previous mentioned activity.

Matter molecules are in a continuous motion.

## Activity 3 (Intermolecular spaces among molecules)

Add 200 $cm^3$ from ethyl alcohol to 300 $cm^3$ of water in a measuring cylinder, then measure their volume.




- What do you observe? .....
- Conclusion: .....

The volume of the mixture is less than 500 $cm^3$, this means that some of alcohol molecules are distributed in the intermolecular spaces found among water molecules. This proves that there are intermolecular spaces between molecules.

Intermolecular spaces are found among matter molecules.

## Activity 4 (Forces of attraction among molecules)

1. Try to fragmentize a piece of iron with your fingers or by hammering it.
2. Try to divide an amount of water on small cups.

- What do you observe? .....
- Conclusion: .....

Attraction forces are found among matter molecules.

The attraction forces among molecules are very strong in solids such as iron and aluminum, but these forces are weak in a liquid state substance like water, alcohol and oil. It is almost not found in gaseous substance such as oxygen, water vapour and carbon dioxide.

Solid Molecules

Liquid Molecules

Gas Molecules

For this, the matter keeps its shape and volume whatever the container shape changes, while the liquid takes the shape of container, but gases have no definite shape. Their molecules are spread in all available spaces.

From the previous, we can summarize molecules properties as follow:

1. Matter molecules are in continuous motion, limited in solids, more free in liquids and completely free in gases.
2. Intermolecular spaces are found among molecules which are tiny in solids, little big in liquids and very large in gases.
3. Attraction forces among molecules are very strong among solids, weak in liquids and almost not existed in gases.

When a solid substance is heated, molecules gain thermal energy which increases the intermolecular spaces and causes a weakness of the intermolecular forces among its molecules, then become more freely to change into a liquid, this process is known as melting.

By continuous heating to the liquid substance, its molecules gain more energy increasing the speed of its motion, moving in large distances and more freely to change into a gaseous state, that spread in all places or the container and this process is known as vaporization.

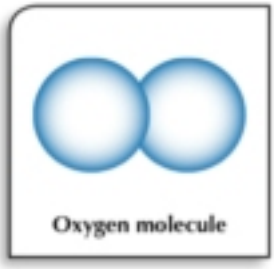
**Enrichment information**

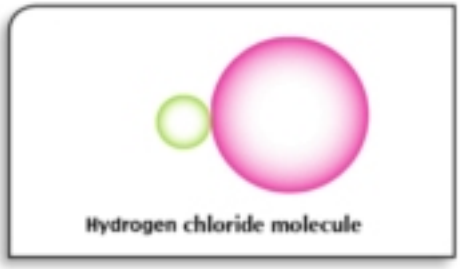
- At the point the substance change from solid state to liquid state' the temperature remains constant until all of the substance change completely into liquid state, although the continually of heating. The extra heat used during the melting process, is known as the latent heat for melting. Further more in vaporization process the heat used for that is known as the latent heat for vaporization at which the temperature remains constant.

## Matter and Molecules:

The molecules of one substance are alike in properties, but they differ than other substance molecules.

Water molecule


Oxygen molecule


Hydrogen chloride molecule

The difference in molecules of various substances is found as a result of the difference in molecular structures.

The molecules are composed of tiny structural units, each of them is known as the atom, and the reason which causes molecules of certain substance differ than molecules of another substance: is the number and the kind of atoms involved in the structure of the molecule and the way they combine together.

A substance which its molecule is consisted only of one kind of atoms, whatever its number is known as an element.

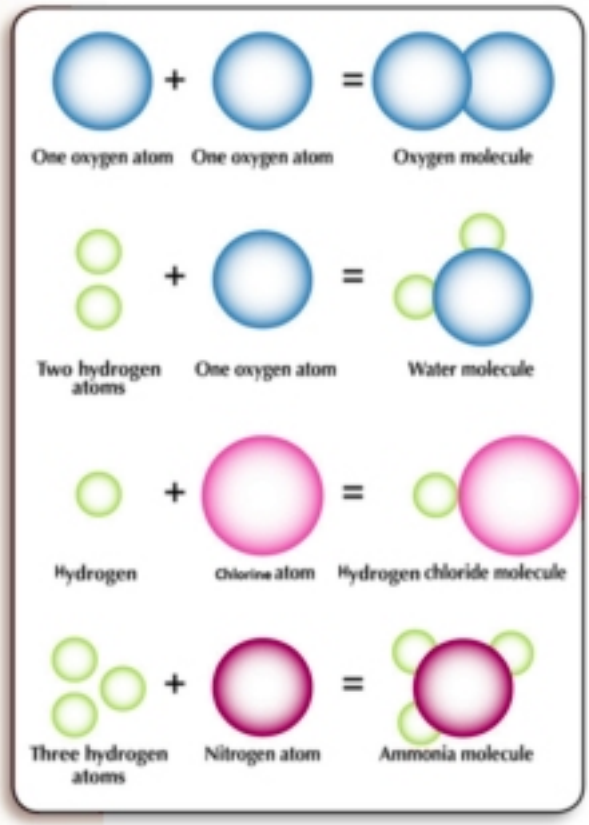
But a substance which its molecule is consisted of different atoms is known as a compound.

Element: is the simplest pure form of a substance, we couldn't decompose it chemically into a simpler substance.

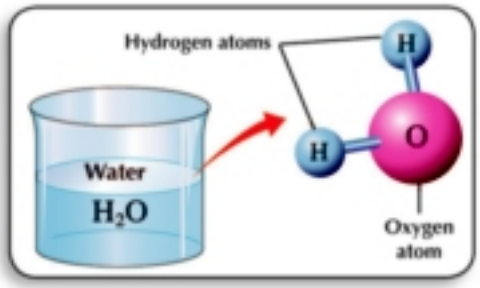
Compound: is the product of a combination of two or more different elements with constant weight ratios.

Exercise

Figures In this table illustrate the reaction of atoms in order to produce molecules of different substances:




1. Determine the number of atoms from which every molecule is formed, illustrate if they are similar or not.
2. Show which of these molecules represent an element molecule and which represent a compound one.
   - There are molecules of gaseous elements composed of two identical atoms such as hydrogen, nitrogen, chlorine, fluorine and oxygen.
   - Molecules of gaseous elements are composed of one atom as in the inert gases (noble gases): helium, neon, argon, krypton, xenon, and radon.
   - Molecules for liquid elements such as bromine (two atoms), mercury (one atom)




   - Compounds molecules have different number of different atoms.

It is noticeable that one water molecule is composed of three atoms: two hydrogen atoms and one oxygen

atom, although the small water drop contains millions of these molecules which can not be seen by naked eye or even by a microscope.

This means that molecules of any substance are very tiny.

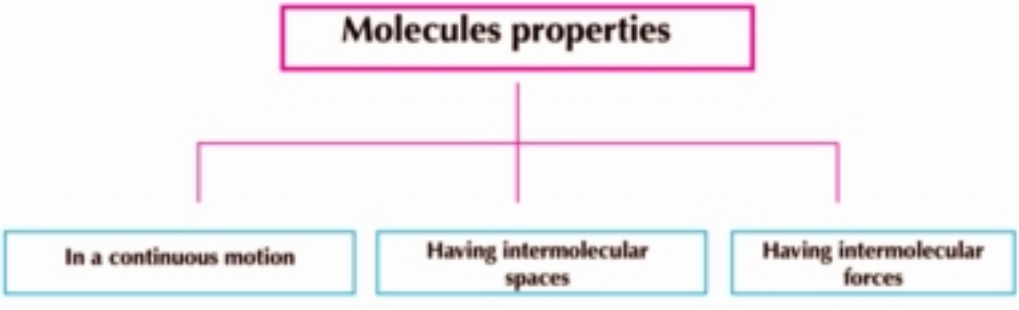
## Optional Activities:

Choose one of these activities to do with a group of your classmates.

- Use the following materials in making models of some molecules of elements and other molecules of compounds: clay – matches – scissros – ruler – compass - pencil - drawing paper.
- Write a short paragraph on substance recycling.

## Summary

- The molecule: is the smallest part in matter that can exist freely having the properties of a substance.
- The element: is the simplest pure form of matter and can not be analyzed into simpler form.
- The compound: is the result of combination between two or more atoms of different elements with constant ratio of masse.



# Exercises

## Question 1:

**Explain a practical experiment to illustrate:**

1. Substance is composed of small tiny molecules.
2. Substance molecules are in a continuous motion.
3. There are intermolecular spaces between molecules.

## Question 2:

**Give reasons for the following:**

1. When adding an amount of table salt to water it disappears after a time.
2. The volume of a mixture of water with alcohol is less than the sum of their volumes before being mixed together.
3. It is very hard to fragmentize a piece of iron with your fingers.
4. It is easy to divide an amount of water into small droplets.
5. The solid substances keep their shape whatever the container shape differs, while the liquid takes the shape of its container.
6. When you leave the perfume bottle opened you smell it all over the room.

## Question 3:

**Write the scientific term for each of the following sentences:**

1. The simplest pure form for a substance, that could not be analyzed into simpler form.
2. The smallest part of a matter can be existed freely and matter properties appear in.
3. The product results of a combination of atoms of different elements with constant ratio as mass.
4. The spaces that found among the molecules.

## Question 4:

**Put (✓) or (✗) in front of the following sentences:**

1. Molecules of the same substance are different from each other.
2. The attraction forces among molecules of solids are very small.
3. The distance among solid molecules are very small.
4. The motion of gaseous molecules are limited.
5. The molecules of solid substances vibrate in a simple vibratory motion.
6. The compound consists from a combination of atoms of one element.

## Question 5:

**Compare among solid, liquid and gas regarding to:**

1. The distance among molecules.
2. The intermolecular forces among molecules.

## Question 6:

A. **Complete the following:**

1. The liquid element its molecule is composed of one atom is ..... while that composed of two atoms is .....
2. The matter is composed of small units called ..... while these units are consisted of smaller units called .....
3. The ..... takes the shape of the container but, ..... has no definite shape.
4. The hydrogen molecule consists of ..... while the argon molecule (inert gas) consists of .....

B. One of your relatives asked you why I smell your perfume although I am far from you, what is your explanation?

## Self reflection and self evaluation

Dear students after studying matter construction fill in this card:

A. What are the items you like in the lesson?

.....

B. What are the items you dislike in the lesson?

.....

C. What are the errors you have done on performing the experiments and activities?

.....

D. What are the errors can be avoided in the next activities?

.....

# Lesson Three

# Atomic Structure of Matter

## Lesson Items

1. Atomic structure.
2. Electronic configuration and chemical reactions.

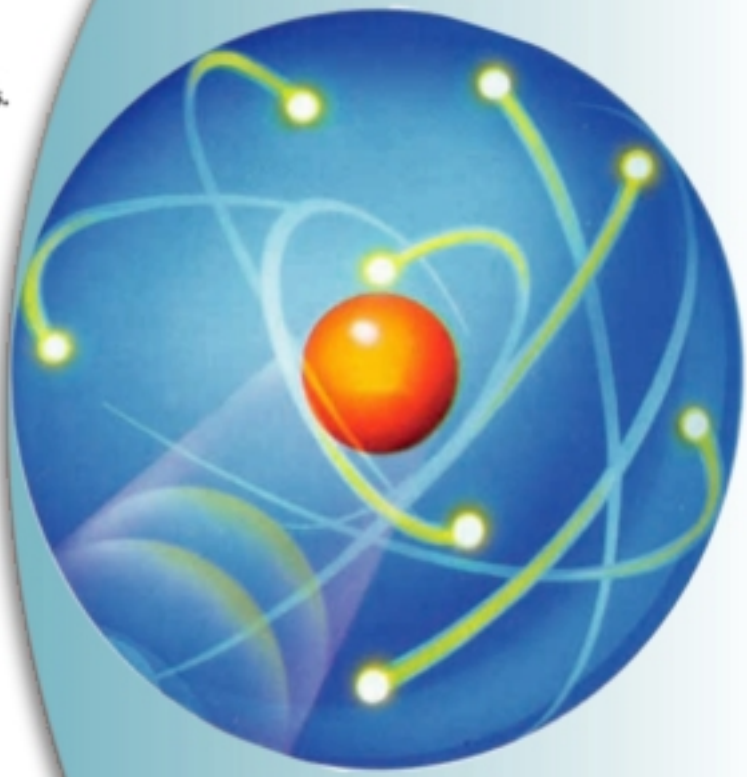
## Lesson Objectives

**By the end of this lesson, a student will be able to:**

- Mention the chemical symbols of the elements.
- Explain the atomic structure.
- Explain the atomic number and mass number.
- Calculate the number of the particles found in the atom by knowing both mass and atomic numbers.
- Identify the energy levels in the atom.
- Determine the rules of electronic configuration.
- Deduce the electronic configuration by knowing the atomic number.
- Deduce the relation between the electronic configuration and chemical activity.
- Design a preliminary model of atom construction.
- Write a short brief about scientists who had studied the atomic construction.
- Appreciate the role of scientists who hau discovered the atom.
- Share some classmates to make a model of atom with its electronic configuration.

## Life Issues

- Applying nuclear energy in peace.



## Chemical symbols of elements

Matter is consisted of molecules. Molecules are consisted of smaller particles called atoms.

Chemists use symbols which easily express the elements. The following table includes the symbols of some of the most famous used atoms of elements.

| Element | Atom symbol | Element | Atom symbol |
|---|---|---|---|
| Lithium | Li | Hydrogen | H |
| Potassium | K | Oxygen | O |
| Sodium | Na | Nitrogen | N |
| Calcium | Ca | Fluorine | F |
| Magnesium | Mg | Chlorine | Cl |
| Aluminum | Al | Bromine | Br |
| Zinc | Zn | Iodine | I |
| Iron | Fe | Helium | He |
| Lead | Pb | Argon | Ar |
| Copper | Cu | Sulphur | S |
| Mercury | Hg | Phosphorous | P |
| Silver | Ag | Carbon | C |
| Gold | Au | Silicon | Si |

From the table above, we find:

1. The symbol represents one individual atom.
2. If the element symbol was one letter it is written in capital.

3. Some elements have more than two letters as a symbol, that because the first letter was common in these elements such as Calcium and Carbon. So we have the carbon of symbol C while the calcium of symbol Ca, the first letter is written in capital and the second in small.
4. Some elements are not derived from English names of the elements and so they have symbols taken from Latin language which are of different letters.

**Example:**

| Element in English | Element in Latin | Element Symbol |
|---|---|---|
| Sodium | Natrium | Na |
| Potassium | Kalium | K |

## Atomic construction:

The scientists operated many experiments to reach the final idea about the atomic construction of nucleus and electrons:

### A. Nucleus:

It is the central core of the atom where its mass and positive charges are concentrated; the nucleus includes.

1. Positive charged particles known as + protons.
2. Neutral particles known as ± neutrons.

To express an atom of any element we use two terms:

Atomic number: it is the number of the positive charged particles (protons) and it is written to the left side below the symbol of the element.

Mass number: is the sum of protons and neutrons number found in the nucleus, it is written above the symbol.

Example: oxygen has atomic number 8 and a mass number of 16, it is written $^{16}_{8}O$

This means that its nucleus contains 8 positive protons and the total number of protons and neutrons = 16, so the number of neutrons in the nucleus can be found from the equation:

**Mass number = number of protons + number of neutrons**

16 = 8 + number of neutrons

Number of neutrons = 16 – 8 = 8 neutrons.

Complete the following table:

| Element symbol | Atomic number | Mass number | Number of protons | Number of neutrons |
|---|---|---|---|---|
| $^{1}_{1}H$ | | | | |
| $^{40}_{20}Ca$ | | | | |
| $^{24}_{12}Mg$ | | | | |
| $^{12}_{6}C$ | | | | |
| $^{35}_{17}Cl$ | | | | |
| $^{23}_{11}Na$ | | | | |

The number of protons may equal the number of neutrons, or the number of neutrons may exceed the protons number and this increases the mass of the atom. If the protons number changes the positive charge of the nucleus changes and also both atomic and mass numbers change and so the atom became of another element.

B. Electrons:

They are negatively charged particles of negligible mass.

- The electrons revolve around the nucleus at a very high speed.

## Activity 1 (Revolving of electrons around the nucleus)

1. Look at an electric fan, at rest.
2. Can you distinguish the blades of the fan?
3. Turn it on. Can you distinguish any of the blades?

Imagine the revolving of the electrons as the rotation of the fan blades. What figure do you expect?

- Conclusion: .....

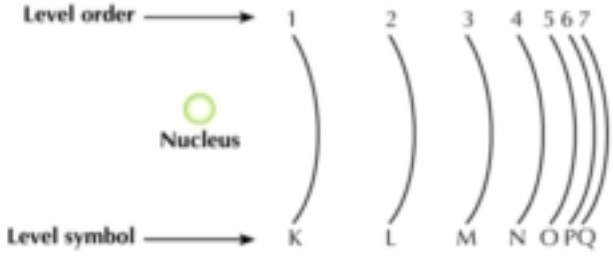
.....

The electrons revolve around the nucleus in orbits known as energy levels.

Energy levels: are imaginary places around the nucleus in which the electrons move according to their energy.

- The number of energy levels in the largest known atom is 7 levels represented from inner to outer levels by letters:

  K, L, M, N, O, P, Q.



- Each level has a certain amount of energy increases by the increase of the level distance from nucleus, this means that energy of level L is greater than that of level K.
- Each level has a certain number of electrons which can revolve in, for example:

  1st level K: is saturated by 2 electrons.
  2nd level L: is saturated by 8 electrons.
  3rd level M: is saturated by 18 electrons.
  4th level N: is saturated by 32 electrons.
  Any other farther level, is saturated by 32 electrons.
- The number of electrons that saturates the level $n = 2n^2$ i.e. it is double the square number of the level order, ( n ) .

**Example:**

1st level K level: n = 1.
Number of electrons saturates the level = $2\ n^2$ where n = 1.
Number of electrons saturates the K level = $2 \times 1^2 = 2$ electrons.

2nd level L level: n = 2.
Number of electrons saturates the level = $2\ n^2$ where n =2.
Number of electrons saturates the L level = $2 \times 2^2 = 2 \times 4 = 8$ electrons.

3rd level M level: n = 3.
Number of electrons saturates the level = $2\ n^2$ where n = 3.
Number of electrons saturates the M level = $2 \times 3^2 = 18$ electrons.

4th level N level: n = 4.
Number of electrons saturates the level = $2\ n^2$ where n = 4.
Number of electrons saturates the N level = $2 \times 4^2 = 32$ electrons.

This equation is not applied for the levels higher than the 4th one since the atom will be unstable.

- An electron is not transferred from one level to a higher one unless it gains some energy equal to the difference between the energy of the two levels, which is known as QUANTUM. The atom will be in excited state. If the atom loses this energy, it returns to its original state known as ground state.

Quantum: It is the amount of energy gained or lost for the electron to transfer from an energy level to another.

- Number of negative electrons = the number of the positive protons in the nucleus, hence the atom is electrically neutral.
- The most outer energy level is saturated with 8 electrons whatever the level order is (except the K level is saturated with 2 electrons only).

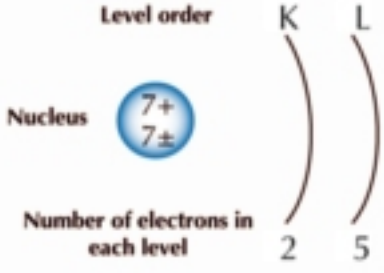
## Electronic configuration:

The atomic number of nitrogen atom is 7, so the number of protons = 7, The number of electrons rotating around the nucleus = 7 as well.

The electronic configuration is:

2 electrons in K level, and 5 electrons in L level.

Also the energy of the level K is less than that of the L level. Electrons are distributed in the 1st level then the second and so on.




The atomic number of sodium atom is 11, so there are 11 electrons in the atom which are distributed as:

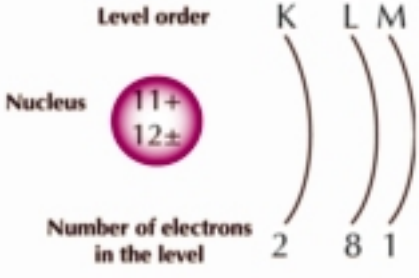
2 electrons in K level,

8 electrons in L level

1 electron in M level

The total = 11 electrons

The configuration is expressed as in the figure.



Exercise

Write the electronic configuration of the following atoms, illustrating the number of electrons in the outer level of each atom , also show the number of the energy levels.

$$^{27}_{13}Al - ^{24}_{12}Mg - ^{35}_{17}Cl - ^{7}_{3}Li - ^{16}_{8}O - ^{1}_{1}H$$

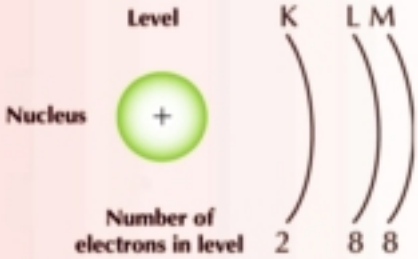
## The electronic configuration and the chemical activity:

The atom is active and not stable as far as the number of the electrons in the outer level is less than 8 electrons.

This means that the chemical activity is related to the number of electrons in the outer level. If the number of electrons in the outer level of an atom is less than 8 electrons, this atom reacts chemically with another atom or more to produce a molecule in a stable state.

There are some atoms like those of the inert gases do not react chemically with other elements.

For example the Argon $_{18}Ar$. Its electronic configuration is as follows:




The atom: is the smallest individual unit of matter which can share in chemical reaction.

Enrichment information

- The following are scientists who contributed the discovery of the atom construction: Greek scientists – Boyle – Dalton – Thomson – Rutherford –Bohr.
- The atom diameter is measured in Angstrom which equals one part of ten thousands million parts of one metre – for example the radius of hydrogen atom = 0.3 Angstrom, this indicates how much the atom is small.

## Optional Activities:

Choose one of the following activities and try it with some of your classmates, ask your teacher to evaluate.

- Materials:

(Coloured papers – number of small spherical objects – copper wire – glue – drawing board – clay).

1. Make a model of oxygen atom $^{16}_{8}O$
2. Show the electronic configuration of sodium atom $^{23}_{11}Na$
3. Write a wall chart to illustrate the development of scientists thinking about atom construction.

## Summary

- Atom: is the smallest individual unit of matter wich can share in a chemical reaction.
  1. Nucleus: which contains:
     a. Protons which are positively charged.
     b. Neutrons which are electrically neutral.
  2. Electrons of negative charges revolving around the nucleus at very high speed in energy levels of symbols K, L, M, N, O, P, Q.
- The atom is electrically neutral because the number of positive protons are equal to the number of negative electrons.
- The atomic number: is the number of positive Protons in the nucleus and is written to the left below the element symbol.
- Mass number: is the sum of the number of protons and the number of the neutrons in the nucleus of the atom and it is written above the symbol.
- Mass number = number of protons + number of neutrons.
- Each energy level carries a number of electrons, and the number that saturates the level of order $n = 2\ n^2$.
- Each level contains an amount of energy which increases by the increase of the distance between the nucleus and this level.
- The quantum: it is amount of energy needed or lost to transfer an electron from an energy level to another.

# Exercises

## Question 1:

A. **Write the symbols of the following elements:**

Sodium – Potassium – Chlorine – Nitrogen – Calcium – Aluminum – Phosphorous.

B. **Write the electronic configuration of the following atoms:**

$^{23}_{11}Na$ – $^{35}_{17}Cl$ – $^{24}_{12}Mg$ – $^{4}_{2}He$ – $^{7}_{3}Li$

1. Indicate the number of electrons in the outer level of each atom.
2. Calculate the number of neutrons in each atom.

## Question 2:

**Give reasons for:**

1. The atom is electrically neutral.
2. The mass number is greater than the atomic number.
3. The 3rd energy level (M) in the atom contains 18 electrons.
4. The equation $2\ n^2$ is not applied on levels higher than the 4th level.
5. Neon atom $_{10}Ne$ does not enter in a chemical reaction through the ordinary conditions.
6. The electrons are distributed to fill the K level before filling the L level.

## Question 3:

**Write the scientific term which relates to the following statements:**

1. The smallest unit of matter construction which share in the chemical reactions.
2. Number of the positive protons in the atom nucleus.
3. Sum of protons and neutrons in a nucleus.
4. Energy needed or lost to transfer an electron from an energy level to another.
5. Particles which are negatively charged and negligible mass that revolve around the nucleus.

## Question 4:

A. **The figures shown represent the electronic configuration of the atoms of some elements:**

Study these figures well then determine each of the following:

1. Atomic number of each atom.
2. Mass number of each atom.
3. Number of electrons in the outer level.
4. Number of energy levels having electrons.

B. One of your classmates asked you to explain why magnesium $^{24}_{12}Mg$ and sodium $^{23}_{11}Na$ atoms are different in both atomic and mass numbers. How do you explain this difference?

## Self reflection and self evaluation

Dear students after studying **atomic structure of matter fill in this card:**

A. What are the items you like in the lesson?

.....

B. What are the items you dislike in the lesson?

.....

C. What are the errors you have done on performing the experiments and activities?

.....

D. What are the errors can be avoided in the next activities?

.....

# Unit 1: General Exercises

## Question 1:

A. **Choose a phrase from column (A) which may mach another from column (B):**

| A | B |
|---|---|
| 1. Density measuring unit | Atomic number |
| 2. Number of positive protons in nucleus | $cm^3$ |
| 3. Substances that can conduct heat and electricity | Mass number |
| 4. Mass measuring unit | Copper and iron |
| 5. Total number of protons and neutrons | g |
| 6. Bad conductors of heat and electricity | $g/cm^3$ |
| 7. Volume measuring unit | Wood and plastic |

B. **Write down the scientific term expresses the following statements:**

1. Smallest particle of the matter which can be freely existed and has the characteristics of its substance.
2. Temperature at which solid substance starts to change into liquid.
3. A smallest particle can share in chemical reactions.
4. Imaginary places in which electrons can move according to their energy.
5. The simplest form of matter which can not be decomposed into a simpler one.

## Question 2:

**Give reasons for:**

1. It is difficult to bend an iron rod.
2. The third energy level in the atom is saturated by 18 electrons.
3. Some table salt disappears after a while when added to water without stirring.
4. Atom is electrically neutral.
5. Substances have different chemical properties.
6. Inert gases can not share in chemical reactions in ordinary conditions.

## Question 3:

A. **Write down the electron configuration of the following atoms:**

$$^{27}_{13}Al - ^{20}_{10}Ne - ^{7}_{3}Li - ^{32}_{16}S$$

Then determine each of:

atomic number – number of neutrons – mass number – number of electrons.

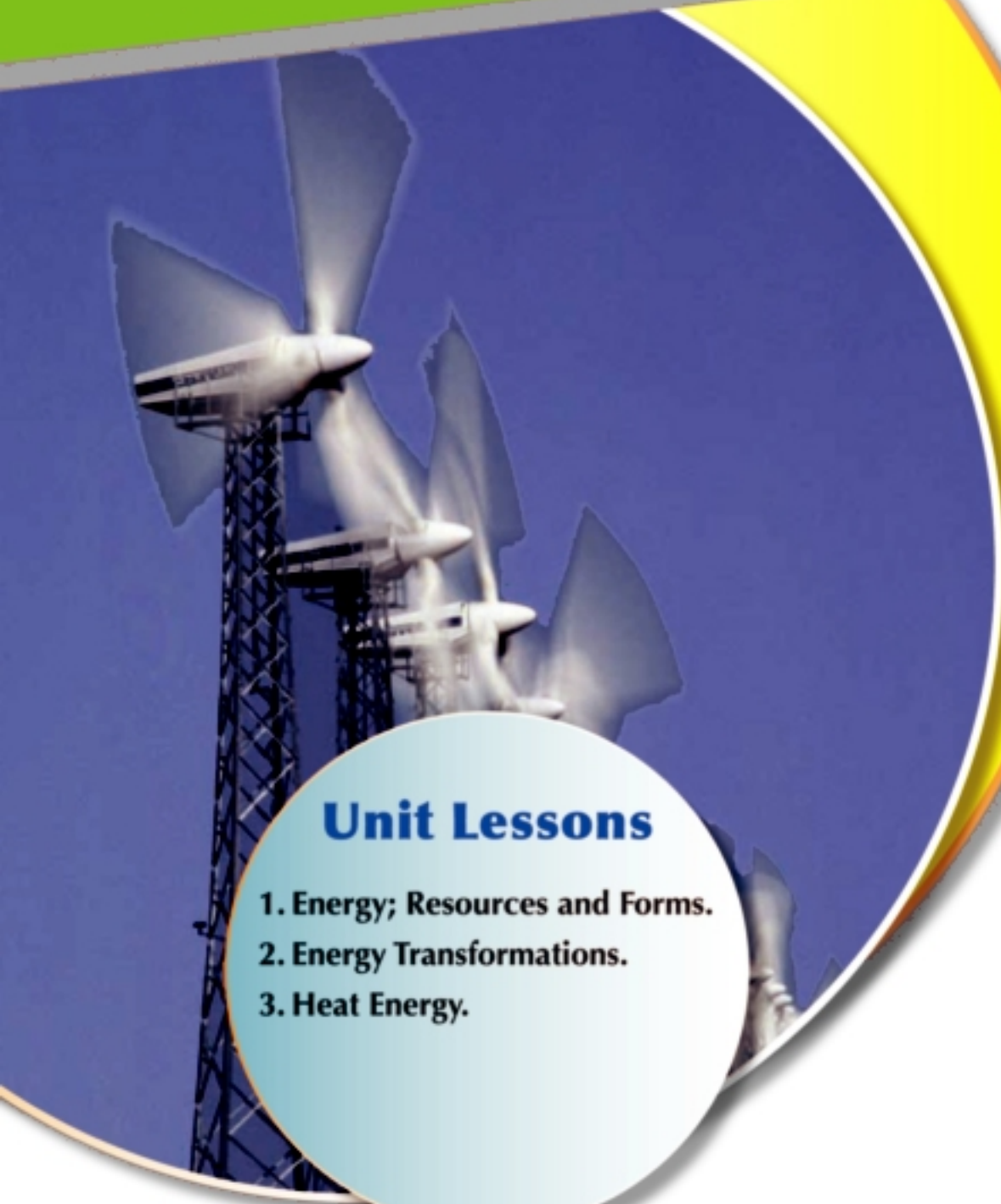
B. **Write down the formula by which you can find each of the following:**

Density – the number of electrons that saturates the energy level of an atom.

# Unit Two

## Energy

- Energy Resources and Forms.
- Energy Transformations.



### Unit Lessons

1. Energy; Resources and Forms.
2. Energy Transformations.
3. Heat Energy.

# Objectives

**By the end of this unit, a student will be able to:**

1. Identify the energy concept.
2. Identify the energy resources.
3. Deduce energy forms.
4. Illustrate experimentally conversion of chemical energy into other forms of energy.
5. Compare between potential and kinetic energies.
6. Compare among the other energy forms.
7. Identify heat concept.
8. Explain the relation between temperature and speed of particles.
9. Illustrate the benefits of technology in using energy resources.
10. Identify the negative influence of technology.
11. Mention examples on technology applications in the domain of energy transformations.
12. Design with some peers a simple electric cell from the materials of local environment.
13. Design a simple electric circuit to show the flow of electric current.
14. Numerate energy forms which we can obtain from the sun.
15. Appreciate the God blessing of energy in the universe.

# Energy; Resources and Forms

Lesson One

## Lesson Items

1. Energy.
2. Energy Forms.
3. Energy resources.

## Lesson Objectives

By the end of this lesson, a student will be able to:

- Identify the energy.
- Identify eras in which man has used energy.
- Illustrate technology benefits of using energy.
- Compare potential and kinetic energies.
- Compare among different forms of energy.
- Appreciate the God blessing of energy forms and resources.

## Life Issues

- International conflict to gain energy.

- Man needs the different forms of energy to operate devices and equipments.

## Activity 1 (Fuel and energy)

What do you expect if the car is not provided with fuel? .....

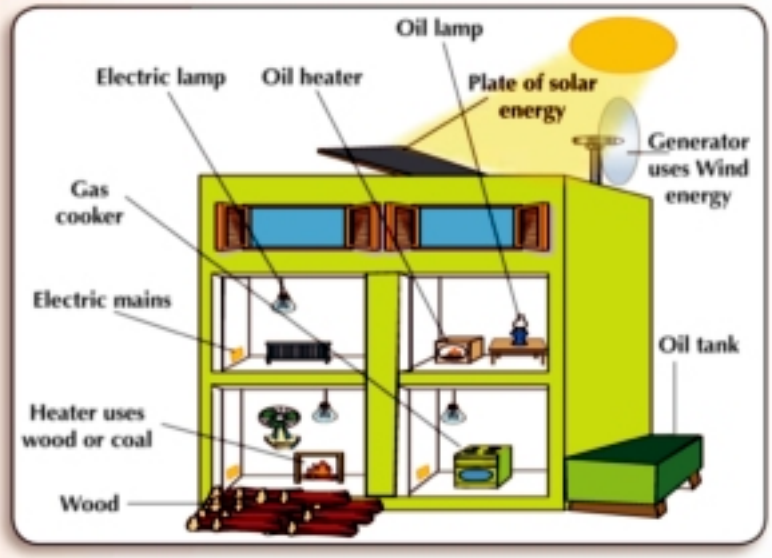
What do you expect if you do not eat any food for a long time? .....

Explanation: energy produced by burning fuel inside the car engine makes the car able to move, also energy produced from food enables man to perform his activities and to do work.

Energy is the ability of doing work or cause a change.

## Activity 2 (Energy forms and its resources)

The following figure shows different forms of energy and different resources: Identify These forms and resources then record in the following table:



| Energy forms | Energy resources |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

Energy forms:

1. Mechanical energy (potential + kinetic)
2. Light energy
3. Sound energy
4. Electric energy
5. Chemical energy
6. Heat energy
7. Nuclear energy

Energy resources are:

1. Sun
2. Wind
3. Food
4. Fuel
5. Water motion
6. Nuclear energy

## Potential energy and kinetic energy:

**Activity 3 (Energy interchanges from potential to kinetic)**

- Raise a tennis ball up to your head level, let it fall, notice the ball during falling then rising and so on.
- Try with your peers to find if the work done, to raise the ball is disappeared.
- Did the ball gain an additional energy or did it keep work done at the beginning?
- Record your observation: .....
- Conclusion: .....

Explanation: As ball is raised, it gains a potential energy which equals the work done in raising it. When the ball is left to fall the potential energy is converted into a kinetic one. Then this kinetic energy is converted again into a potential one as the ball returns to rise and so on.

- The work done is stored in a form of potential energy.
- Work done = force x displacement.
  (Displacement in case of potential energy = height).

- Potential energy: energy stored in the object due to a work done on the object.
- Kinetic energy: work done during the motion of an object.

- On reaching the ground an object has only kinetic energy which equals in this moment the mechanical energy.
- At maximum height the mechanical energy of the object is only its potential energy.
- The sum of potential and kinetic energies of an object is the mechanical energy.

## Factors affecting potential energy:

### Activity 4 (The effect of weight on potential energy)

- Take 4 identical spheres, let them on plared ground.
- Raise one sphere from ground up to a table level.
- Raise two spheres up to the same level of the table.
- Repeat using 3 spheres.
- Record notes about the effort you feel each turn: .....

Potential energy stored in an object increases as weight of object is increased.

### Activity 5 (The effect of height on the potential energy)

- Bring a somewhat heavy sphere.
- Raise the sphere half a metre height and let it fall.
- Repeat what done and increase the height each time.
- What do you notice in each time the sphere reaches the ground? .....
  .....

Potential energy increases by the increase of height at which the object reaches.

Potential energy = weight x height

- Weight = mass x gravity acceleration of earth (assumed gravity acceleration is constant in one place).

## Factors affecting the kinetic energy:

### Activity 6 (The effect of both mass and speed of motion on the kinetic energy)

A. 2 cars of identical mass, which one needs more work to stop if one car is moving faster than the other? .....

B. Two cars one has a mass larger than the other, are moving at same speed, which needs more work to stop? .....

The kinetic energy of moving objects increase by the increase of each of mass and speed of motion.

Kinetic energy = 1/2 x mass x square of the speed.

Mechanical energy = kinetic energy + potential energy.

### Exercise Calculating the mechanical energy:

**Numerical Example:**

A ball was launched upwards and vertically at a speed 3 m/s up to a height 4 m. **Calculate the mechanical energy of** the ball if its weight is 5 Newton, and has a mass 0.5 Kg.

Solution: Potential energy = weight of the ball x height = 5 x 4 = 20 Joule

Kinetic energy = 1/2 x mass x square of speed = 1/2 x 0.5 x (3 x 3) = 2.25 Joule

Work done = Mechanical energy = potential energy + kinetic energy = 20 + 2.25 = 22.25 Joules.

## Optional Activities:

Choose one of the following activities, and try with your peers in the class to perform it: Ask your teacher to evaluate.

1. Name the energy forms in your home then determine devices which depend on one of these forms.
2. Write a short account about the importance of energy in our life.

## Summary

- Energy: is the ability of doing work.
- Energy forms:
  - Light energy.
  - Sound energy.
  - Electric energy.
  - Chemical energy.
  - Heat energy.
  - Nuclear energy.
- Energy resources:
  - Sun.
  - Wind.
  - Food and fuel through chemical reactions.
  - Water motion.
  - Nuclear reactions.
- Potential energy: energy stored in an object due to work done on it.
- Kinetic energy: work done during motion.
- Potential energy = weight of the object x height.
- Kinetic energy = 1/2 x mass x square of speed.
- Mechanical energy = potential energy + kinetic energy.
- Weight = mass x gravity acceleration.

# Exercises

## Question 1:

**Choose the correct answer:**

1. Resource of permanent energy is .....
   A. Petrol. B. Sun.
   C. Nuclear reactions. D. Coal.
2. Mechanical energy is the sum of ..... energies.
   A. Potential and heat. B. Light and kinetic.
   C. Potential and kinetic. D. Potential and light.
3. An object of 20 N weight is placed at 5 m height, it has a potential energy .....
   A. 50 J. B. 150 J.
   C. 100 J. D. 200 J.
4. An object of mass 2 kg is moving at a speed of 4m/s has a kinetic energy .....
   A. 16 J. B. 64 J.
   C. 32 J. D. 128 J.
5. Chemical energy can be stored in .....
   A. Car battery. B. Stretched spring.
   C. Raising a load upwards. D. Car lamps.
6. As doubling height to which an object is raised from ground so the .....
   A. Kinetic energy is increased to its double value.
   B. potential energy is increased to 3 times.
   C. Potential energy is increased to double value.
   D. Mechanical energy is increased 4 times.

## Question 2:

The developed countries aim to use solar energy, wind and water motion more than before.. Explain.

## Question 3:

Compare between potential and kinetic energies of an object.

### Self reflection and self evaluation

Dear student, as you finish the study of matter and its characteristics try to fill in this card:

A. What are the items you liked in the lesson?

.....

B. What are the items you didn't like in the lesson?

.....

C. What are the errors you have done during experiments and activities performance?

.....

D. What are the errors you can avoid in next activities?

.....

E. What is the best expression you have heard in this lesson?

.....

# Energy Transformations

Lesson Two

## Lesson Items

1. Energy conservation.
2. Technology and energy transformations.

## Lesson Objectives

**By the end of this lesson, a student will be able to:**

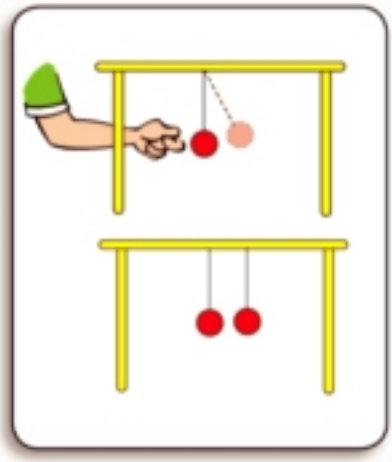
- Identify law of energy conservation.
- Design a model of a simple electric cell from materials of local environment.
- Name the benefits of technology in using energy resources.
- Give examples of technology applications of energy transformations.
- Make experiments to change chemical energy into heat, electric and mechanical energy.
- Name some negative effects of technology and its danger on man and the environment.

## Life Issues

- Technology and society.

Previously you have studied transformation of energy, for example in the electric bulb the electric energy is changed into light, also in the electric iron the electric energy is changed into heat energy and so on.

## Activity 1 (Conservation of mechanical energy)



Push with your hand gently a simple pendulum then leave it.

- Record your observations about the pendulum motion. .....

Repeat the procedure with two pendulum shown in the figure:

- Record your observations .....

On displacing the pendulum, a work is done, this work is stored in form of potential energy. When it is left the potential energy is converted gradually into kinetic energy till it reaches a maximum speed where all of its energy is converted into kinetic one.

This is repeated while the pendulum keeps its mechanical energy.

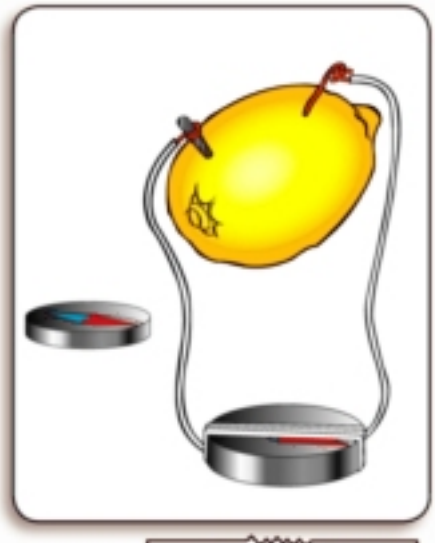
## Exercise 1

How much alike are the motions of the children swing and the pendulum?

- What do you observe? .....
- Conclusion: .....

In both the swing and the pendulum the potential and kinetic energies are interchanged without ending, the sum of the two energies at any moment is constant.

## Simple electric cell:

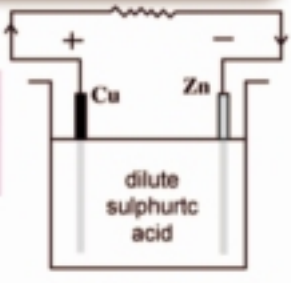


### Activity 2 (Lemon and electricity)

- Materials:
  1. A large lemon. 2. A small compass.
  3. A copper wire. 4. A zinc rod.
- Procedures:
  - Try to soften the lemon.
  - Dip the zinc rod and the copper wire in the lemon .Form an electric circuit near a compass as in figure.
- What do you observe? .....
- Conclusion: .....

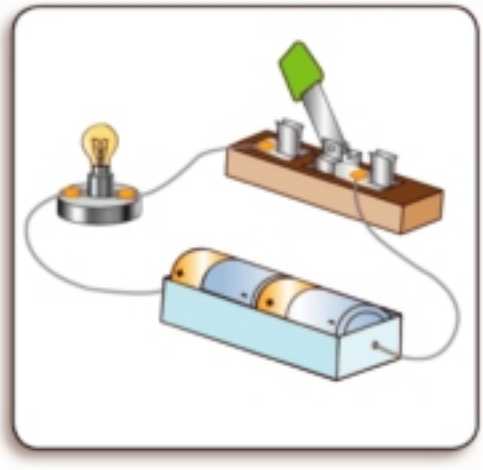
Simple Electric cell is composed of an acid solution with two different metals dipped in. Chemical reactions convert chemical energy into electric energy.

Remark: try to use some tubers of potatoes instead of lemon .Does it also produce electricity?




Simple Cell

### Activity 3 (Electric circulation)



- Materials:
  1. A Dry electric cell.
  2. A light electric bulb.
  3. Wires for connection.
  4. A switch.
- Procedures:
  - Make an electric circuit as in the figure shown.
  - Let circuit off for one minute then switch it on.
- What do you observe? .....

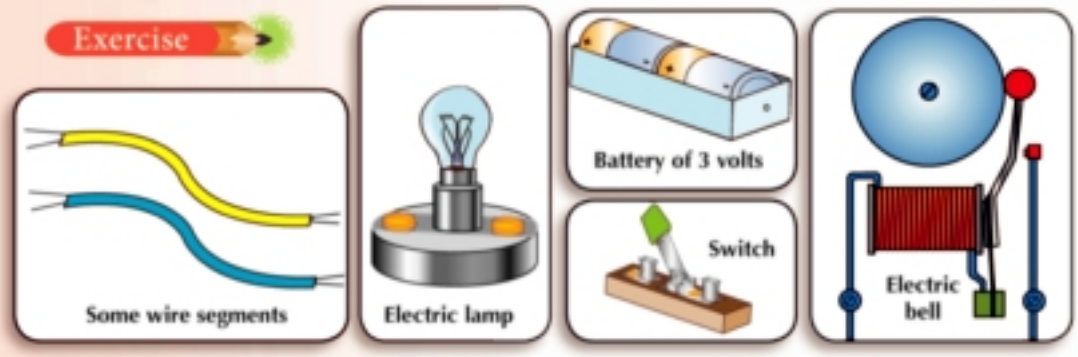
- Touch the glass of the bulb after asking your teacher.
- What do you observe? .....
- Conclusion: .....

In the electric lamp; electric energy is converted into light energy and heat energy.

**Attention**

- Don't touch glass bulb of light lamp in home while it is on, because it is of a very high temperature.

**Exercise**




Use the materials and objects shown above to set a tool to let a deaf friend has attention, also to set another tool for the same purpose for a friend who can not see.

## Activity 4 (Energy transformations)

On operating a car engine, several transformations of energy take place. Mention some of these transformations .....

**Inside the car:**

- Fuel stores chemical energy which burning inside the car and is converted into heat energy which produces mechanical energy that causes the car to move.
- The electric generator (dynamo) converts a part of mechanical energy into electric energy.
- A Part of electric energy is converted into light energy in the car lamps.
- Another Part of electric energy is converted into sound energy of the car in the radio cassette.
- A third part of the electric energy is converted into heat energy once again in the heater of the air conditioning of the car and so on.

## We had studied:

Energy is not destroyed but can be transformed from one form to another with numerous applications of technology, like the engine of the internal combustion (car engine) – dynamo – electric lamp – radio cassette – and electric heater.

From the previous transformations, we can deduce the law of energy conservation.

**Law of energy conservation:**

Energy is neither created nor destroyed but it is converted from one form to another.

- Look around and name the applications of technology then name the energy transformation found in.

## Activity 5 (Energy and environment)

There are some harms of technology applications of energy transformation. What harm is caused by each of the following:

1. Car exhaust .....
2. Chemical pesticides .....
3. Nuclear weapons .....
4. The webs of wireless transmitters of cellular phones .....

Technology has negative effects since man used it in:

1. Wars and killing.
2. Massive destruction.

Some technology applications have results which cause environmental pollution; such as electromagnetic pollution, chemical pollution of air, pollution of water, pollution of soil, electromagnetic pollution and noise pollution .

## Optional Activities:

Choose one of the following activities to do with some of your peers in the class, ask your teacher to evaluate the report

1. Draw a diagram map to illustrate the energy transformations which takes place in each of:
   A. A Television set.
   B. A Cellular phone.
   C. A Sewing machine.
2. Draw a simple electric circuit of a battery, a switch, an electric motor rotates a light fan and an electric lamp then write down the role of each below the drawing.

## Summary

- Law of energy conservation:

  Energy is neither created nor destroyed but it can be transformed into another form.
- Role of technological Applications:

  Using energy resources and energy transformations from a form to another which man needs in his life.
- Technology has negative effects when man used technology in:
  1. Killing and wars.
  2. Massive destruction.

# Exercises

## Question 1:

**Choose the correct answer:**

1. Electric energy is converted into kinetic energy in .....
   A. Electric lamp. B. Cellular phone.
   C. Electric fan. D. Electric bell.
2. Energy is neither created nor destroyed but it can be transformed into another form, this law is known as law of _____ .
   A. Conservation of energy. B. Conservation of matter.
   C. Kinetic energy. D. Earth gravity.
3. The role of technological application is represented in .....
   A. Using energy resources and converting energy from a form to another.
   B. creating energy from nothing.
   C. Storing energy as its form is.
   D. Illustrating energy forms.
4. In the solar batteries the solar energy is directly converted into ..... energy.
   A. Kinetic. B. Light.
   C. Electric. D. Sound.

## Question 2:

How can you explain the efforts of some countries to share in some organizations which concern the environment protection? Do you think that we need such organizations?

## Question 3:

Illustrate some technological applications in our life then mention their negative effects?

## Self reflection and self evaluation

Dear student, as you finish the study of energy transformation try to fill in this card:

A. What are items you have liked in the lesson?

.....

B. What are items you didn't like in the lesson?

.....

C. What are the errors you had done during experiments and activities performance in the lesson of energy transformations?

.....

D. What is the activity you have done in this lesson and you got admired?

.....

E. What is the best encouragement you have achieved about this lesson?

.....

# Heat Energy

Lesson Three

## Lesson Items

1. Heat concept.
2. Relation between heat and particles movement.
3. Technology and obtaining heat.

## Lesson Objectives

**By the end of this lesson, a student will be able to:**

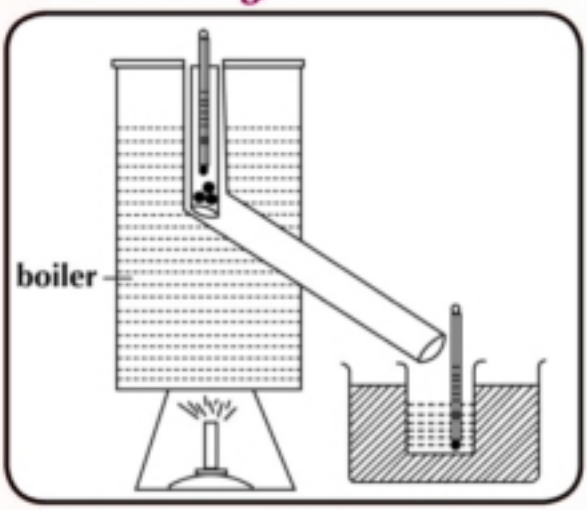
- Identify the heat concept.
- Explain the relation between temperature and speed of particles.
- Do experiments of converting mechanical energy into heat energy.
- Compare between the technological applications in different energy transformations.

## Life Issues

- Environment protection.

Man is always searching to discover the nature of heat and how it is transferred since primitive eras.

## Activity 1 (Heat and its transferring)




1- Bring a beaker contains small amount of water, then record the temperature of water .

2- Heat a group of metal balls by using boiler , then record the temperature of the balls .

3- Fall the hot balls in the water , and record the temperature of the water and the balls together .

4- What is your observations .....

Conclusion:

## Activity 2 (Movement of the particles and temperature)

1. Put some identical spheres made of metal in a plastic cup then determine the spheres temperature first.
2. Place another identical cup above the first one so that they are tightly together as in figure.
3. Invert the positions of the two cups upside down from 20 to 30 times then determine temperature at the end.

- Record your observations: .....
- What is your explanation: .....
- Conclusion:

1. Spheres movement and its friction with each other causes temperature rise.
2. Temperature is raised as speed of spheres increases, i.e. as the kinetic energy of the particles increases.

## Activity 3

1. Place your bicycle inverted upside down as in the figure opposite.
2. Let the pedal turn fast, then press the bicycle brakes strongly.
3. As the rotation stops touch the frame of the wheel, what do you feel? .....

.....

- Conclusion: .....

.....

Friction turns mechanical energy into heat energy.

Heat energy: is a form of energy which transfers from a higher temperature object to a lower temperature object.

Temperature: it is the condition which determines the direction of heat energy whether from or to the object when it comes in contact with another, temperature is directly proportional to the kinetic energy of the particles.

## Activity 4 (Heat transferring)

1. Put a metal spoon in a cup of hot tea.
   - What do you feel? .....
   - Conclusion: .....
2. Switch on an electric heater in the room, how is heat transferred from it? .....
   - Conclusion: there are three ways for heat transfer:

     A. Heat transfers by conduction: heat transfers through solids from one end to another.

     B. Heat transfers by radiation: heat transfers from hot object to another without any need for a material medium through which heat transfers.

     C. Heat transfers by convection: heat transfers in gases and liquids where hot layers have less density, and rise upwards while colder layers have more density and fall down.

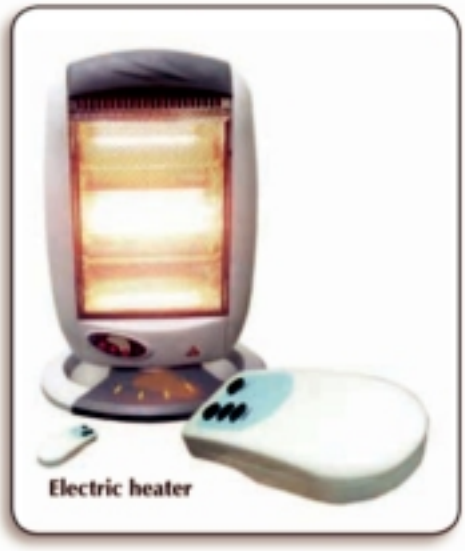
## Exercise

1. Why is the freezer found at the top of the fridge, while the electric heater is placed down on the ground?
2. There are a lot of technological applications to produce heat in our environment.

   Determine three of these applications, then compare among them from your point of view of their effect on the environment.

## Technological applications to produce heat:

1. Heater.
2. Water heater.
3. Stove.
4. Ovens.


Electric heater

Some of these applications work by petrol fuel (as a non permanent Resource). Some other applications work with solar energy as a permanent Resource).

Some pollute the environment, some others do not.

On studying the different energy resources, we find that most of the resources depend on that energy produced by sun.

### Exercise

1. Regarding the technological applications and energy transformations mention some technological applications which use the solar energy and change it into other forms.
2. Think of the relation of solar energy with the rest of energy resources and forms you use.

### Optional Activities:

Choose one of these activities and try to perform it

1. Write a research on the relation among all energy forms with solar energy, then represent it in front of your peers to discuss them
2. Draw a sketch diagram which illustrates energy transfer from solar energy to other four energy forms, at least.

## Summary

- Heat energy:

  One of the energy forms transfers from a higher temperature object to a lower temperature object.

- Temperature:

  It is the heat condition which determines whether heat transfers from or to an object when it comes in contact with another. And it is directly proportional to the kinetic energy of the particles.

- Ways of heat transfer:

  1. Heat transfers by conduction.
  2. Heat transfers by radiation (does not need any material medium).
  3. Heat transfers by convection.

Solar furnace

- Technological applications which produce heat:

  1. Heater.
  2. Water heater.
  3. Stove.
  4. Ovens.

  The origin of most of energy resources and its forms on Earth's surface is solar energy.

# Exercises

## Question 1:

**Choose the correct answer:**

1. Mechanical energy is converted into heat energy by means of .....
   A. Electric generator.
   B. electric heater.
   C. Friction among moving particles with each other.
   D. Electric motor.
2. Heat transfer by radiation takes place through .....
   A. Liquids only.
   B. Gases only.
   C. Material media and nonmaterial ones.
   D. Metals only.
3. In solar heaters, solar energy is converted into .....energy.
   A. Light.
   B. Electric.
   C. Heat.
   D. Kinetic.
4. Sun is .....
   A. Resource of permanent energy.
   B. Resource of non permanent energy.
   C. Not an energy resource.
   D. Producing no energy.

## Question 2:

**How can you interpret?**

It is preferred using solar heater to any other heater such as electric or gas ones.

## Question 3:

**Complete the following table by suitable completion:**

| Technological applications | Resource of energy Permanent/ nonpermanent | Effect on environment Polluting/non polluting |
|---|---|---|
| Electric heater | | |
| Electric water heater | | |
| Solar heater | | |
| Electric stove | | |
| Gas stove | | |
| Solar oven | | |

### Self reflection and self evaluation

Dear student, after studying the lesson try to fill in this card:

A. What are the items you liked in the lesson?

.....

B. What are the items you didn't in the lesson?

.....

C. What is the best activity you have done?

.....

D. What are the problems you have faced on performing the activities?

.....

# Unit 2: General Exercises

## Question 1:

**Choose the correct answer to complete the following statements:**

1. In the filament of electric lamp the .....
   A. Electric energy is converted into mechanical energy.
   B. Light energy is converted into heat energy.
   C. Electric energy is converted into heat energy.
   D. Chemical energy is converted into light energy.
2. When car lamps and radio cassette are on, there is a change inside the car battery from .....
   A. Chemical energy into a light one. B. Chemical energy into a sound one.
   C. Chemical energy into an electric one. D. Electric energy into light one.
3. In home when the gas stove is working there is a change from .....
   A. Heat energy into a chemical one. B. Chemical energy into a heat one.
   C. Chemical energy into a sound one. D. Light energy into a heat one.
4. As an object falls downwards .....
   A. The potential energy increases. B. The kinetic energy increases.
   C. The mechanical energy is lost. D. The speed of the object decreases.
5. As an object is launched upwards, .....
   A. Its speed decreases. B. Its speed increases.
   C. Its kinetic energy increases gradually.
   D. Its potential energy decreases gradually.
6. In the simple pendulum, there is an energy transformation from .....
   A. Mechanical energy into a sound one.
   B. Mechanical energy into a light one.
   C. Potential energy into a kinetic one and vice versa.
   D. Kinetic energy into a heat one.
7. Heat is transferred through solids by .....
   A. Conduction and convection. B. Radiation only.
   C. Radiation and convection. D. Conduction only.
8. Mechanical energy is converted into heat energy by .....
   A. Combustion. B. Friction.
   C. Chemical reaction. D. Electric current.
9. Heat transfers from a heater by .....
   A. Conduction and radiation. B. Radiation and convection.
   C. Conduction and convection. D. Radiation only.

## Question 2: What is meant by the following?

A. Potential energy of an object is 20 Joule.
B. Potential energy of an object is 20 Joule.
C. Mechanical energy of an object is 100 Joule.
D. Heat energy.

## Question 3: Give reasons for:

A. The freezer is found at the top of fridge.
B. The heater is placed on the ground.
C. Fuel in a car as food for a man.
D. Nuclear stations which produce electricity are preferred to those of petrol stations.
E. Ecologist do not appreciate all the technological applications which used in energy transformations.

## Question 4:

Name five of the technological applications which convert an energy form to another. Then mention what the energy transformation in each application is.

## Question 5:

**A stone of 5 Kg mass falls from 8 m height, what is its potential energy? And what is its kinetic energy? In each of the following:**

A. At the start of falling.
B. At height 2m.
C. On reaching ground (consider gravity acceleration = 10 m/ $s^2$).

## Question 6:

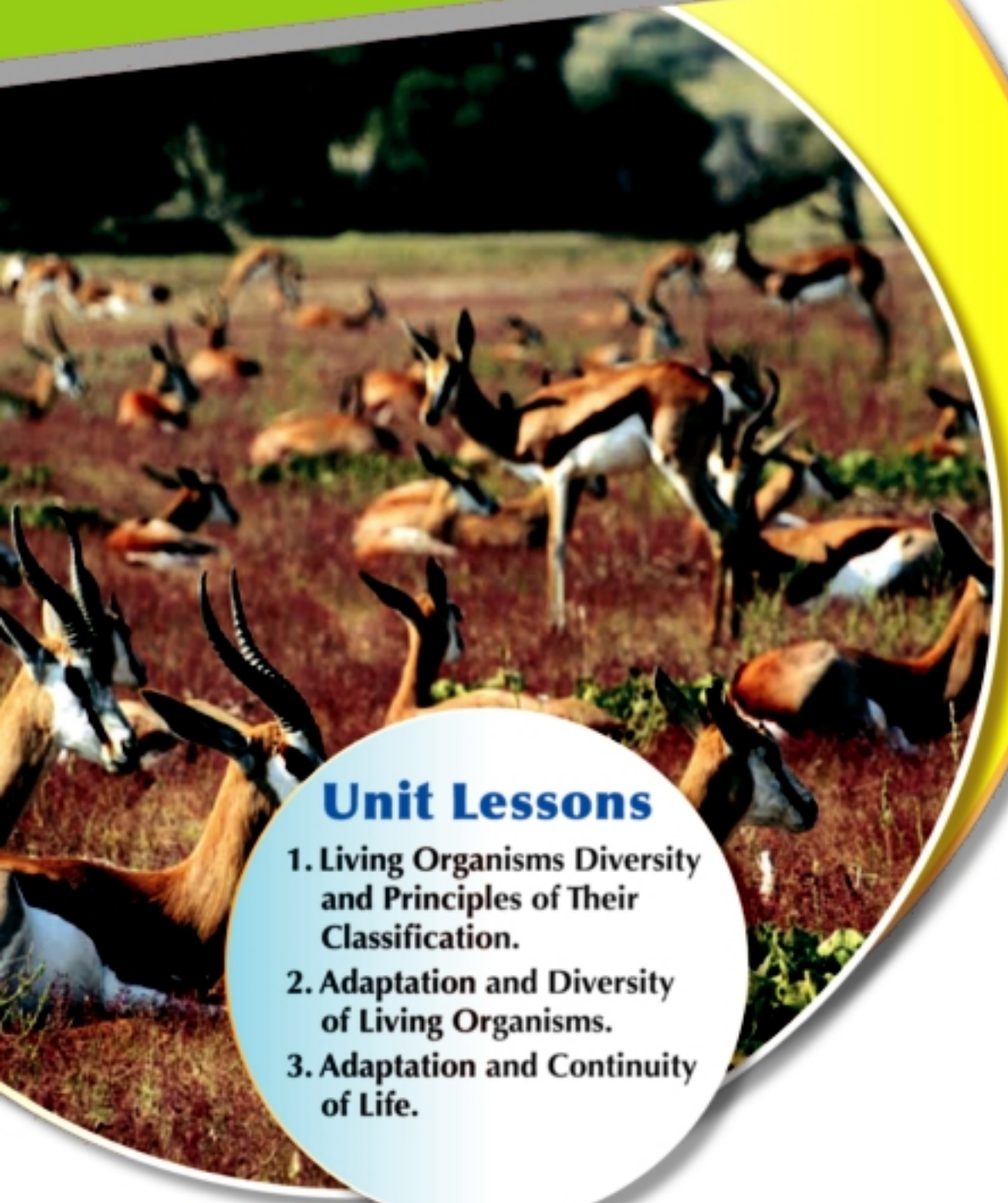
**Find the weight of an object of potential energy 88 Joule when found at a height 11 m.**

## Question 7:

**An object has a kinetic energy 64 Joule and is moving at a velocity 4 m/s. Find the object mass.**

# Unit Three

# Diversity and Adaptation in Living Organisms



## Unit Lessons

1. Living Organisms Diversity and Principles of Their Classification.
2. Adaptation and Diversity of Living Organisms.
3. Adaptation and Continuity of Life.

# Objectives

**By the end of this unit, a student will be able to:**

1. Observe the diversity among living organisms in its environment.
2. Plans to classify living organisms.
3. Explain some principles of living organisms classification.
4. Design tables to classify living organisms existed in his environment.
5. Design with his classmates an album to classify some living organisms.
6. Use the microscope to examine microorganisms.
7. Infer that the species is the basic unit of classification for living organisms.
8. Identify the adaptation concept.
9. Discuss his classmates about the reasons of adaptation.
10. Identify the types of adaptation.
11. Give evidences for adaptation in living organisms.
12. Analyze the functional suitability to different types of the bird beaks and legs coped with their life styles and feeding.
13. Understand the need of predator plants to capture insects as a resource of nitrogenous substances.
14. Identify some of the extinct animals and the reasons of this extinction.
15. Know more about the reasons of living organisms adaptation.
16. Understand the reasons of hibernation, aestivation and bird immigration.
17. Compare the submerged aquatic plants and desert plants.
18. Enumerate the most adaptation features in the camel and show their types.
19. Appreciate the grandeur of Allah and Allah's peerless ability.

# Living Organisms Diversity and Principles of Their Classification

Lesson One

## Lesson Items

1. Diversity of living organisms.
2. Principles of classification.
3. The species is the basic unit of classification in living organisms.

## Lesson Objectives

By the end of this lesson, a student will be able to:

- Observe the diversity among living organisms in their environment.
- Share his (her) classmates making classification plans for living organisms.
- Design tables to classify the living organisms existed in his (her) environment.
- Design an album with his (her) classmates to classify some living organisms.
- Use the microscope to examine microorganisms.
- Infer that the specie is the basic unit for classifying living organisms.

## Life Issues

- Protecting living resources.

When you pay a visit to the zoo, You may see the animals in the zoo... And you observe how much the variety among these animals in the shape..., size..., and the way of feeding..., the environment where these animals live..., and a lot of other different characteristics that living organisms differ from each other.

There are big animals such as the elephant, and rhinoceros .... and small animals such as the rabbit, rat and lizard. There are animals live in water such as fish, crocodiles and hippopotami and others live on land such as the horse, lion and dog.

Variety is not only restricted to animal world but we can also see it clearly in plant world.

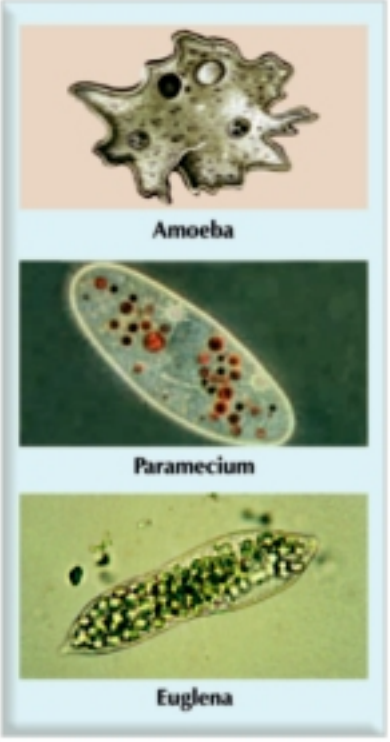
We see huge trees such as camphor and palms... and short weeds such as clover and gargeer... plants carry large - sized leaves such as banana plants... others carry small - sized such as molukhiyah.

## Diversity of micro organisms:

Diversity also extends among living organisms to the micro organisms which can't be seen with nacked eye, but they spread out everywhere around us in air soil and water. They can be seen only by the microscope.

### Activity 1 (Examining a drop of pond water)

- **Materials:**
  - Pond water.
  - A glass slide.
  - A glass cover slip.
  - Methylene blue dye.
  - A dropper.
  - A light microscope.
- **Procedures of preparing the sample:**
  1. Add a drop of methylene blue solution to a little amount of pond water.
  2. Put a drop of pond water on the glass slide and cover it gently with a glass cover slip.
- **Procedures of examining the sample:**
  1. Put the glass slide on the microscope stage and use the small objective lens to examine the sample.
  2. Repeat the sample examination using a high power objective lens.
- **Describe what you see:** .....
- **The results of examination:**
  - You may see a lot of organisms - most of them are unicellular organisms such as Amoeba, Euglena and Paramecium
  - These microorganisms differ from each other in shape... and the way of movement.



## Living organisms classification plans:

Due to the enormous diversity of living organisms, it became compulsory to classify them into groups to ease their studying.

Here are some classifying plans based on scientific bases and principles:

## First: Classifying plants according to the Shape:

**Activity 2**

Examine the plant samples in the pictures below, then share your classmates to classify these plants depending on the shape:

Red algae

Brown algae

Wheat

Corn

- Record your observations: .....
- Conclusion: plants differ according to the external appearance:

A. Some plants can't be distinguished into roots, stems and leaves such as the green, Red and brown algae.

B. Most plants can be distinguished into roots, stems and leaves such as corn, wheat, palms and camphor plants.

## Second: Classifying plants according to the reproduction style

Plants are classified according to the way of reproduction into:

1. Plants reproduce by formation of spores: Voughair and Adiantum are examples of small terrestial plants that are known as ferns.

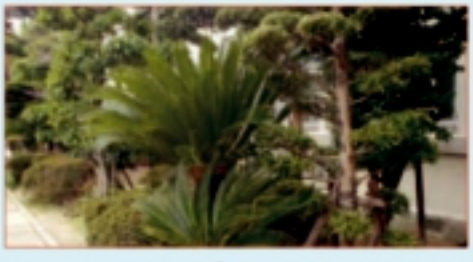
Voughair

Adiantum

2. Plants reproduce by the formation of seeds: They are divided into:

A. Gymnosperms: The seeds of these plants are formed inside cones but not inside pericarp such as Pine and Cycas plants.

Pine



Cycas

B. **Angiosperms (Flowering plants):** they are divided into:

- Monocotyledon plants: such as maize and wheat plants.
- Dicotyledon plants: such as beans and pea plants.

Pea

## Third: Classifying living organisms according to the nature of body supporting

Animals are classified according to the existence of support into:

A. Soft bodies: Such as jelly fish, octopus, and worms where the body doesn't have a support.

Jelly fish Octopus Earth worm

B. Supported bodies: These animals are divided according to the location of the support into:

1. Animals with external support such as mussels and snails.
2. Animals with internal support as in vertebrates such as fish, reptiles, birds and mammals.

Bony fish Snail

Aquatic turtle

## Fourth: Classifying arthropods according to the number of legs:

Arthropods are invertebrate animals that are characterized by a type of legs known as jointed legs. Arthropods can be classified according to the number of these legs.

### Activity 3 (Classifying arthropods animals according to the number of legs)

House fly

Worker bee

Ant

Spider

Scorpion

Julius

Examine the samples shown above. They are a group of arthropods. Classify them into groups based on the number of legs in each group. Record the results in the following table.

| Arthropods | Number of legs |
|---|---|
| House fly / bee/ ant | ..... |
| Spider/ scorpion | ..... |
| Scolopendra/ Julius | ..... |

- Conclusion: Arthropods can be classified according to the number of legs into:
  1. Insects: have three pairs of jointed legs such as locusts, bees, flies, and cockroaches.
  2. Arachnids: have four pairs of jointed legs such as the spider and scorpion.
  3. Myriapods: such as scolopendra and Julius.

## Fifth: Classifying mammals according to the type and number of teeth.

### Activity 4 (Identifying the teeth type and number in some mammals)

Examina the skull of a cat, rat and a rabbit. Realize the shape, type and number of teeth in each of them.

- Record your observations: .....

- Conclusion: Mammals are classified according to the existence of teeth into:

A. Edentats (Teethless mammals): Such as the sloth and armadillo.

Sloth

Armadillo

B. Mammals having teeth: According to the shape and type, these mammals are divided into:

1. Animals have front teeth extending outwards such as hedgehog to capture the insects.
2. Animals have pointed - canines and molars with sharp projections such as the lion and tiger.

Hedgehog

Tiger

3. Animals have sharp incisors: are divided according to their number in each jaw into:
   - Rodents: these animals have one pair of incisors in each jaw such as the rat and squirrel.
   - Lagomorphs: these animals have two pairs of incisors in the upper jaw and only one pair in the lower jaw such as the rabbit.

Squirrel

Rabbit

## Taxonomy

It is a branch of biology searching the similarities and differences among living organisms, and placing the similar ones in groups according to a certain system in order to ease their studying.

## «Species» the basic classification unit for living organisms

Linnaeus had considered the species as fundamentals of a natural classifying system. To recognize the concept of species, let's perform the following activity:

### Activity 5 (Classifying a group of animals into species)

Look carefully at this group of animals, then classify them according to their external shape.

Placing these animals into three groups is the best classification: the cat group, the dog group, and the rabbit group.

Cats differ from each other, but they are more different than rabbits, so it is impossible for cats to mate to rabbits whereas mating can take place between two any couple of cats whatever the difference is in shape or size, so cats are placed in one species whereas rabbits are placed in another one and so do dogs.

**Enrichment information**

- Marriage may take place among semi - similar species, but the produced offsprings are barren in the most of Cases For example, when an intermarrage take place between a donkey and a horse, they produce a barren female known as mule.

African, Asian and European human whatever their colors, race or home are, they all belong to one species «Human».

## Species

Is a group of more similar living organisms inshape that can reproduce to give birth of new fertile individuals that are able to reproduce and therefore keeping the existence of the species .

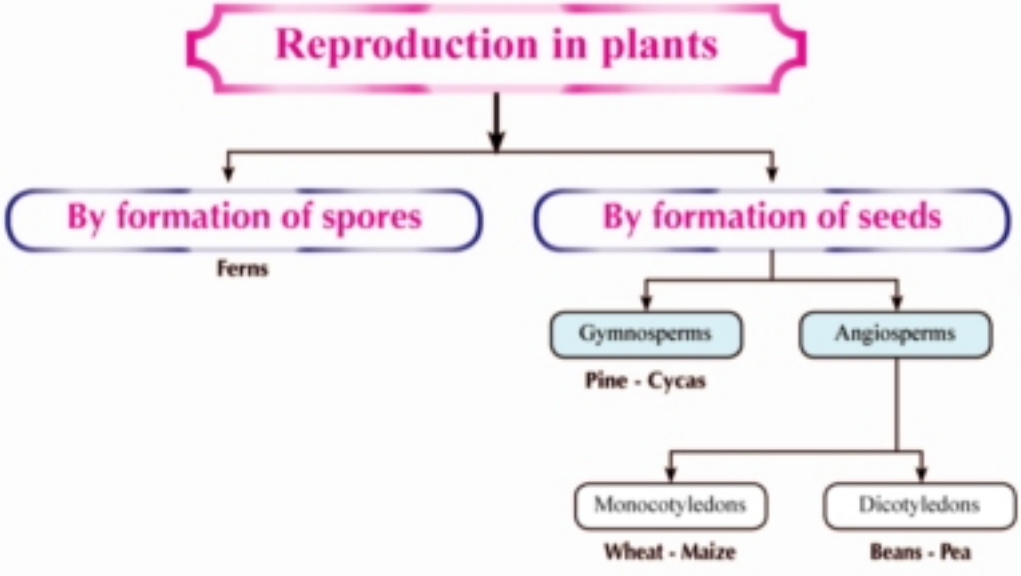
### Optional Activities:

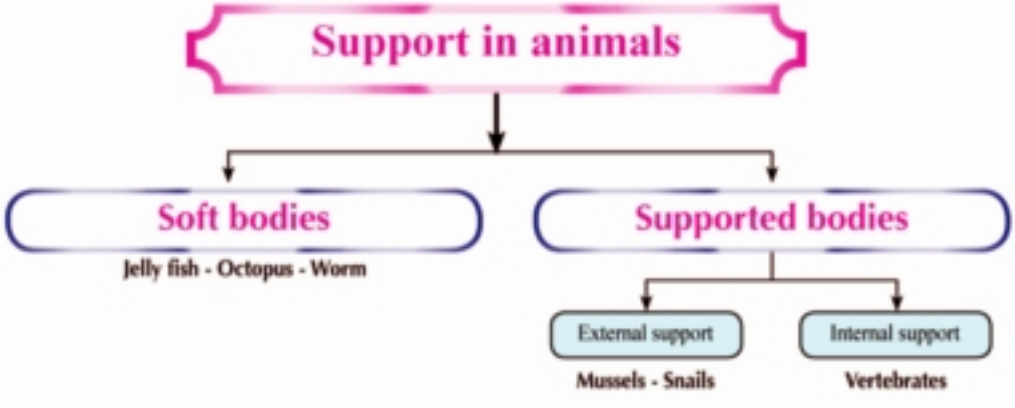
Of the optional activities, choose an activity and carry it out,

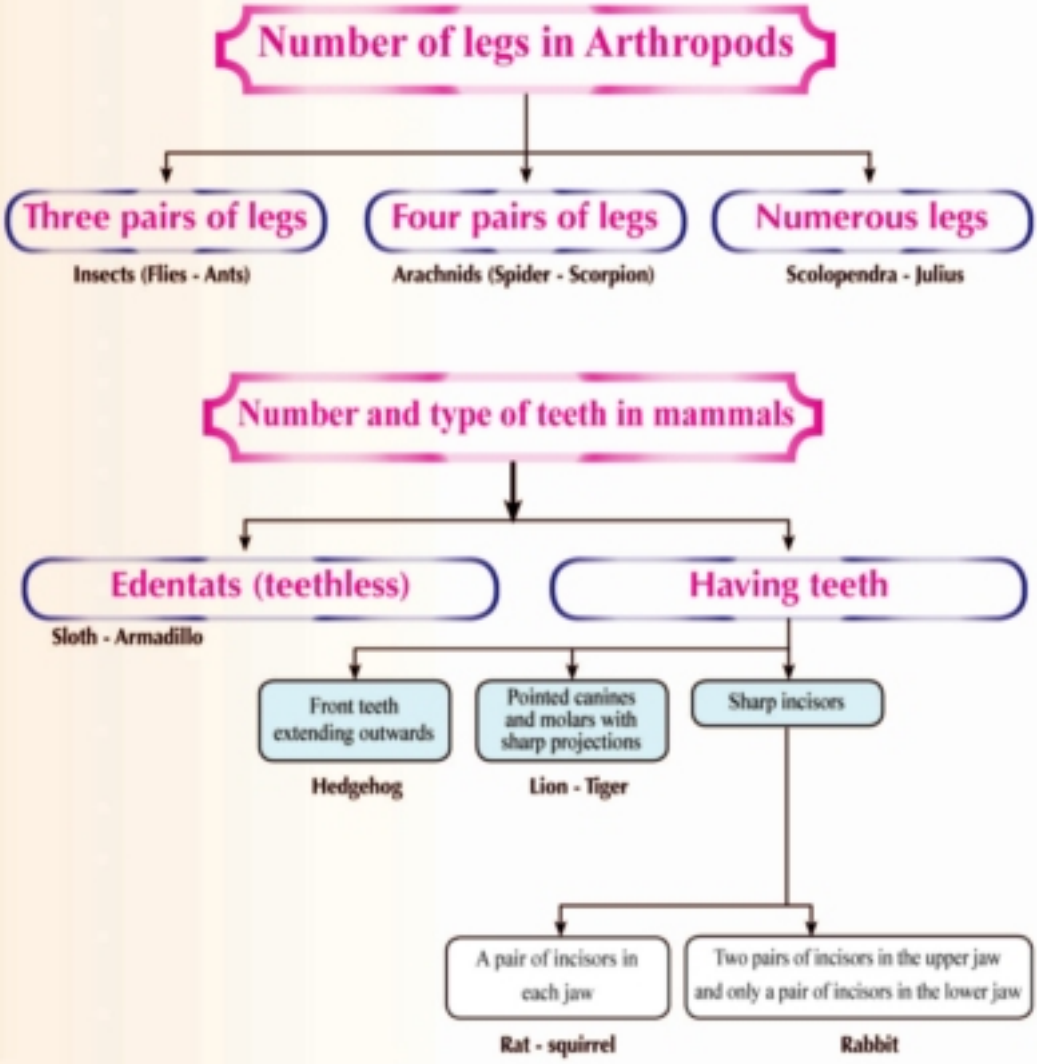
1. Collect some pictures of different living organisms, and classify them into groups. Then place them to your album.
2. Collect a large number of plant leaves and use newspapers (to remove water out of them) then classify them according to their:
   A. size. B. Shape.

# Summary

## Plans for classifying some living organisms






- Species: Is a group of living organisms mostly similar to each other in their shape characteristics and are able to mate and produce new fertilized members that are able, in turn, to reproduce and keep the species existence on.

# Exercises

## Question 1:

**Complete the following:**

1. .....and ..... are teethless mammals.
2. Arthropods can be classified according to the number of legs into .....,..... and .....
3. ..... and ..... are used in classifying plants.
4. Some plants have large - sized leaves such as ..... and some has small - sized leaves such as .....
5. ..... is the basic unit of classification in living organisms.

## Question 2:

**Choose the correct answer:**

1. The scorpion belongs to ..... :
   (insects - myriapods - arachnids - mammals).
2. ..... is an example for plants that reproduce by spores:
   (pine - beans - vougheir - wheat).
3. ..... are from the animals which don't have a body support:
   (reptiles - snails - Jelly fish - cartilaginous fish).
4. The number of pairs in scorpion legs is .....
   (3 - 4 - 44 - 100).

## Question 3:

**Cross out the unsuitable word each of the groups below:**

1. (Locust - Mosquito - Spider - Cockroach - Flies).
2. (Lion - Tiger - Dog - Wolf - Armadillo).
3. (Beans - Pea - Corn - Pine - Wheat).
4. (Octopus - Desert snail - Frog - Fresh water mussels - Tilapia).

## Question 4: Give reasons for:

1. Hedgehog has front teeth extending outwards.
2. When a zebra mates a donkey, they can't produce fertile individuals.

## Question 5: State a difference between each of the following:

1. A rabbit and a squirrel.
2. Beans plant and wheat plant.
3. The pine and palm trees.

### Self reflection and self evaluation

Dear student, after studing the lesson try to fill in this card

A. What are the items you like in the lesson?

.....

B. What are the items you dislike in this lesson?

.....

C. Can you add more other classifying plans for the living organisms classification?

.....

D. What are the problems you encountered in classifying living organisms?

.....

# Adaptation and Diversity of Living Organisms

## Lesson Two

### Lesson Items

1. Adaptation «Types/reasons».
2. Adaptation and motion.
3. Adaptation and food nature.

### Lesson Objectives

By the end of this lesson, a student will be able to:

- Recognize the concept of adaptation.
- Work with his (her) classmates to discuss the reasons of adaptation.
- Recognize the types of adaptations.
- Give evidences for adaptation in living organisms.
- Analyze the functional suitability of bird beaks and legs with the living and nutrition way.
- Understand the insectivorous plants requirement for catching insects as a resource of nitrogenous substances.

### Life Issues

- Protecting the threatened species against extinction.

Multiplicity of environments where living organisms live were the most important reasons lead to the living organisms diversity in order to cope with the environmental changes such as Climate change, food diversity, and existence of water.

## Activity 1 (A camel pad and a horse hoof)

- Describe the camel pad .....
- Describe the horse hoof .....
- How much do the camel pad and horse hoof cope with their environment? .....
.....
- The camel pad ends in a thick flat one to enable the camel wondering through the hot desert sands where as the horse hoof ends in a strong solid end to help the horse go through the rocky soil.

Camel pad

Horse pad

- Conclusion: The structure of the camel pad and the horse hoofs cope with the method of motion and the environment condition where each of them lives this is known as adaptation.

**Example:**

What will happen if the camel exchanges its ped with a horse's hoof and vice versa? .....

## Adaptation

Is a modification in a living organism or its body structure or even the biological function of its organs to become more adapted to the environmental conditions where it lives in.

## Types of adaptation

A. Structural adaptation (anatomical): it studies the structure of one body organ such as the horse hoof and camel pad structure.

B. Functional adaptation: The ability of some organs and tissues to do a specific function such as secreting sweat in case of high temperature as in human and secreting poison as in snakes.

C. Behavioral adaptation: As in bird migration or some animals are active in different times of the day light such as the active birds during the day and night.

## Reasons of adaptation:

However, the multiplicities of conditions which living organisms response in all types of environments on the earth, the reasons of adaptation to get food remain the most important ones, then the motion way which helps the animal do that and enables it to escape from its enemies in dangerous situations. For plants, most plants are adapted to the different environmental conditions:

## First: Adaptation and Motion:

### Adaptation and motion diversity in mammals.

Mammals live in varied environment, these environment force them to move in different ways. Some mammals walk using the four feet, others fly and others swim or dive in water. Mammals' limbs are largely modified to answer the desired (required) motion.

**Activity 2 (Motion diversity in Mammals)**

Look at the following pictures of mammals then work with your classmates to answer the following question.

Whale

Bat

Gorilla

Horse

How much does the method of motion suit the animal environment and its living style? .....

What are the modifications taken place in the limbs of this animals to enable them moving in different ways? .....

- Record your observations: .....
- Conclusion: .....

Way of movement varies in mammals either swimming, flying, running, or climbing. However, the limbs of all these mammals are structured with similar bones, some modifications had happened to these limbs to match up movement and the animals style life and also to match with the dominant environmental conditions.

## Modification of front limbs in mammals:

- Paddles of whales and dolphins for swimming
- Wings of bats for flying .
- Legs of the horse for running.
- Long arm of monkeys for climbing and catching things.
- Conclusion: Modifications in mammals' limbs enable them to move in different ways that match with their environment and life style.

## Second: Adaptation and nature of food:

### 1. Adaptation and food variety in birds:

Birds spread out all over the known environments on the earth, thay adapt to their environments and the way of having food through different ways such as the modifications in their beaks and legs.

### Activity 3 (Examining models of birds' beaks and legs)

Examine a group of birds' beaks and legs shown in the picture... Discuss your classmates how much are the structure and shape of birds' beaks and legs matching up with the condition of the environment and the food type that the bird depends on.

- Record your data: .....
- What do you infer? .....

Bird's beaks and legs are modified and varied in their structure according to the food type and environmental conditions they have for example:

1. Predatory such as hawks and vultures that have sharp and strong crooked beaks to enable to tear the prey. These birds have four fingers end in strong and sharp claws: of these strong fingers, there are three front fingers and a back one. All these fingers are able to bend to control pouncing the prey.
2. Birds feed on shallow water worms and snails have long and thin beaks to pick up worms and snail. Further more, they have long and thin legs ending in thin fingers to walk in the existence of water.
3. Water birds such as ducks and geese which feed on mosses and fish have wide indented beaks in the two sides to help them filter the food from water whereas their legs are palm to help swimming.

- Conclusion: Modifications of birds' beaks and legs are adapted to the food types and the way of movement.

Drosera

Dieonea

## 2. Adaptation in Insectivorous plants:

Predacious plants are self - feeding green plants that can perform photosynthesis and make carbohydrates such as any other plants. These type of plants can absorb the nitrogenous substances needed to form proteins so some parts are modified in order to pounce and digest the insects then absorb the nitrogenous substances that their bodies need. Drosera, dieonea and halophila are examples of these plants.

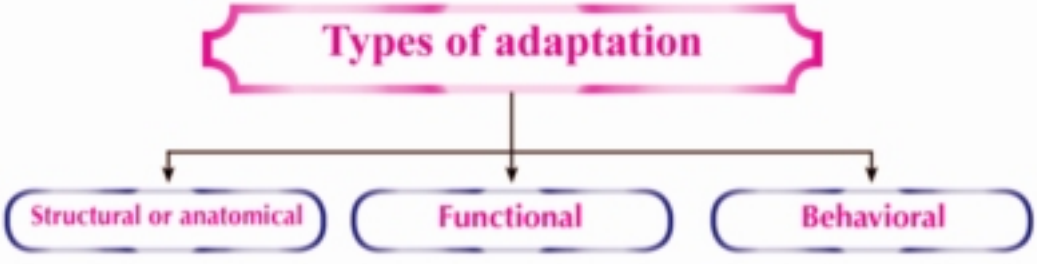
Halophila

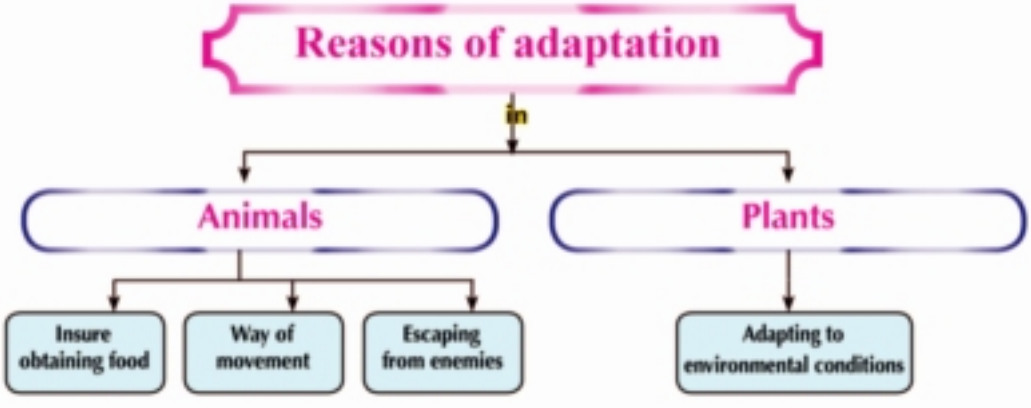
### Optional Activities:

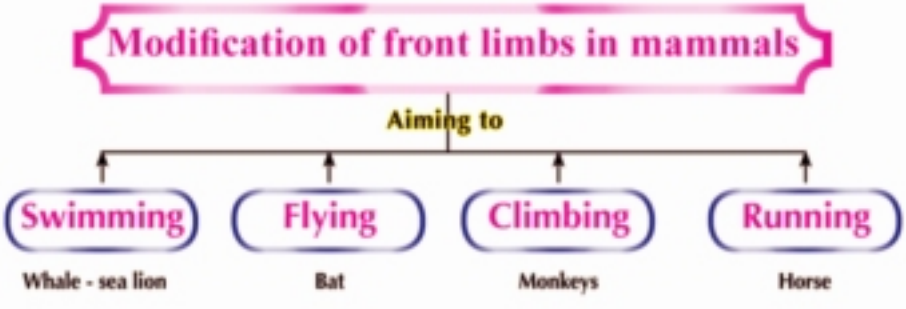
- Collect some pictures of different kinds of birds which live in your local environment, then write shortly about the adaptation of each one's legs and beaks and its survival style.

## Summary

- Adaptation: is a modification in behavior, structure or the biological function of a living organisms organs become more adjustable with the environmental conditions where it lives.



# Exercises

## Question 1:

**Complete the following:**

1. .....and ..... are examples for Insectivorous.
2. Hawks have ..... beaks to tear the prey, whereas ducks have ..... beaks to filter food from water.
3. Horses limbs end in ..... to run over rocky soil where as camels limbs end in ..... to walk on hot sandy soil.
4. The whale front limbs are modified into ..... to perform ..... to take the role of ..... whereas they modified in the bat into ..... to take the role of .....

## Question 2:

Compare between the functional and anatomical adaptations and give an example to each of them.

## Question 3: Give the reason:

1. Some birds have long and thin beaks, and their long legs end in thin toes.
2. Some plants pounce insects.

### Self reflection and self evaluation

Dear student, as you finish the study of this lesson try to fill in this card:

A. What are the items you like in this lesson?

.....

B. What are the items you dislike in this lesson?

.....

C. What are the difficulties you have faced when carrying the lesson activities out? .....

# Adaptation and Continuity of Life

Lesson Three

## Lesson Items

1. Adaptation with the permanent environmental conditions.
2. Adaptation with the temporary environmental conditions.
3. Adaptation for hiding.
4. Camel is the desert ship.

## Lesson Objectives

By the end of this lesson, a student will be able to:

- Identify some extinct animals and the causes of their extinction.
- Understand the reasons of hibernation, aestivation and birds migration.
- Compare the submerged aquatic plants and desert plants.
- List the most important features of adaptation in the camel and show their types.
- Appreciate the grandeur of Allah and his limitless power.

## Life Issues

- Protecting and beautifying the environment.

## Unit Three:

Dinosaur

Many different living organisms lived on earth across its history. Some of these organisms couldn't adapted to the environmental changes, so they perished as what happened to dinosaurs and mammoth.

Mammoth

Many other species of living organisms had succeeded in continuation of life due to their adaptation with the environmental changes.

Examples of adaptation in living organisms.

### 1. Hibernation:

In winter, when temperature is decreased, some animals hide in burrows such as some reptiles and some insects, or bury themselves in mud, stop feeding and their activities are decreased, as frogs, to overcome the decreasing of temperature.

Tree frog

In spring, when the environment conditions become favour, these animals return back to their normal activities.

### 2. Aestivation:

In summer, when temperature rises up, especially in desert areas, living organisms face an extreme rising in temperature and a shortage in water and rains. These organisms become dormant and hide in humid burrows in order not to be affected by rising of temperature.

Jerboa

Examples of animals that undergo aestivation are jerboa, desert snail and some other insects.

### 3. Birds migration:

Some species of birds are adapted to the environmental conditions by migration from cold and polar regions, during winter, to more lighted and warmer regions for reproduction then, they return back to their original habitats in favour to the climatic conditions in spring.

These birds inherit this behavior where they migrate into the same places at the same times every year. Example: quail bird.

**Enrichment information**

- Animals that hibernate or aestivate store an amount of food as fats in their bodies to provide them with energy needed to keep their life during the period of dormancy. Fats other than the other kinds of food by production of large amounts of water on their reusing, so these animals store food and water together in the form of fats.

### 4. Adaptation in the aquatic and desert plants:

Aquatic and desert plants face contrasting conditions. Aquatic plants live submerged totally in water as elodea plant, or partially such as hyacinth plant (Nile rose) these plants are exposed - especially the totally submerged ones- to a shortage of dissolved oxygen and light in water and to the presence of water currents.

Desert plants, on other hand, face a shortage in water and an extreme rising in temperature during daylight.

How are these kinds of plants adapted to their environmental conditions?

#### A. Adaptation of aquatic submerged plants:

Example: Elodea plant

- Roots are weak because they are not needed for water.
- Leaves are ribbon like small sized, so they will not be cut by water currents. They are sessile (neckless), so their connection with the stem will be more stronger.

Elodea plant

- Stem is elastic, so it will not be torn by water currents. It contains many air chambers in its inside to store a part of oxygen gas produced in photosynthesis process to be used in respiration and to help plant float in the more lighted regions of water.

B. Desert plants:

- Desert plants are generally small sized in comparing to the plants of the environments that have good supply of water. The following adaptations can be noticed in desert plants:

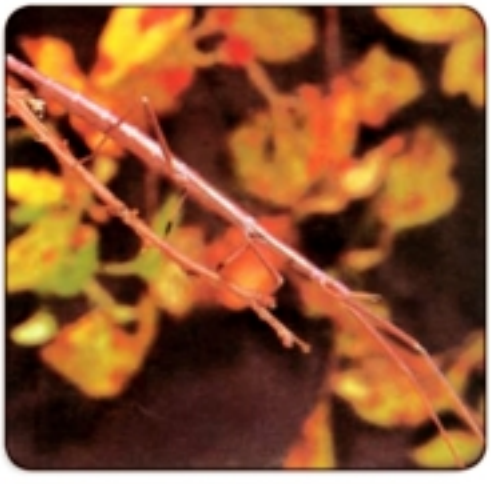
Cactus

Opuntia

- Roots: are well formed. They may extend vertically in the soil for great depths to reach the humid layers of soil, such as calamagrostis plant, or spread horizontally to absorb a largest amount of rain water or dew and store it in the stems, as in opuntia plant, or in the succulent (juicy) leaves and as in cactus plant.
- Leaves: are small sized, may be ribbon like and spiralled and stomata are little in number and lie deeply to reduce the loss of water by transpiration, as in calamagrostis plant, or are used in storing water, as in cactus, and surrounded with a waxy layer to prevent water loss by transpiration.
- Stems: are short to avoid the strong winds, as in cactus plant. They may be rich in chloroplasts to perform photosynthesis, and they are reduced into spines, as in opuntia plant.

## 5. Adaptation for hiding:

Some animals can colour themselves with the dominant colours in the environment, so they become no prominent aim for their enemies, as the leaf - insect which is hardly discovered by its enemies because it looks like the plant leaves exactly in colour and shape of wings, and the stick - insect which looks like the branches of plants as well.



Stick insect

Leaf insect

Chameleon colours itself with the dominant colours of the environment to be hidden from its preys of insects to capture them and feed on.

Camouflage: is the ability of some living organisms to be hidden from their enemies or to capture the preys in the predatory species.

Chameleon

## Camel is the desert ship

Camel is considered as one of the most adapted animals to live in deserts. It is also considered as an example for the structural, functional, and behavioral adaptations that helped it live in the hard conditions of desert.

Some adaptation features in camel:

- Camel has a plentiful number of lachrymal glands and two rows of long eyelashes that protect its eyes from the dispersing sand on time of sandstorms. Camel can also control the opening and closing of its nostrils.
- Camel's ear is small and covered with dense hair from inside to obstruct dust and sand.
- The thickness of camel's fur differs at different body regions. It is more dense over the vital body regions to provide protection to them from the extreme cold at night. It is also little dense over other body regions to ease heat loss by radiation during daylight.

- Camel's legs end in a broad pad to prevent their diving in the smooth sand, and thick skin to protect them from high temperature of the soil.
- The forked upper lip camel's mouth and the strong enamel of its teeth enable it to eat the spiny and dry desert plants without harming it.
- Camel stores an amount of fats in its hump to keep its survival for 3 - 4 months without eating any food.
- Camels blood temperature is not constant as in other mammals. It changes from 34°C in the morning to 41°C during the daylight hours, so it has no need for sweating.
- Camels sweat glands don't start sweating unless the blood temperature reaches 40°C.
- Camel can drink 100 liters of water through 10 minutes only without affecting its blood composition. After that, camel can survive for a week or more without drinking any additional amounts of water.
- Camel can lose 25% of its body weight when water and food are not available and its blood composition remains constant. This rate exceeds the other mammals ability by twice nearly.

**Enrichment information**

- The pyramidal shape of camels hump makes the area that exposed to the thermal sun rays more smaller as possible during daylight, so it decreases the amount of the absorbed heat and also decreases the amount of the lost heat by radiation during night.

## Optional Activities:

By the help of the available books in school library or the internet, write a research in one of the following topics:

- Camouflage in insects.
- Extinct endangered species and the necessity of their protection.

## Summary

- Adaptation with the environmental conditions:

1. Hibernation and aestivation.
2. Birds migration.
3. Adaptation of aquatic and desert plants.
4. Camouflage: is the ability of some living organisms to simulate the dominant environmental conditions to be hidden from their enemies or even to capture the preys in the predatory species.

# Exercises

## Question 1:

**Choose the correct answer:**

1. The examples of living organisms that undergoes hibernation is the .....
   A. desert snail. B. jerboa.
   C. frog. D. all the above.
2. Water is stored in the leaves of ..... plant.
   A. elodea. B. cactus.
   C. calamagrostis. D. wheat.
3. Leaves are reduced into spines in ..... plant.
   A. opuntia. B. cactus.
   C. calamagrostis. D. elodea.
4. There are air chambers in the leaves of ..... plant.
   A. opuntia. B. cactus.
   C. calamagrostis. D. elodea.

## Question 2:

**What happens in each of the following cases:**

1. Adaptation of living organisms do not take place in the environmental conditions.
2. Ending of camel's legs with a pad.
3. Rising of camel's body temperature to 40ºC.
4. Absence of air chambers from elodea stem.

## Question 3:

**Give an example showing each of the following:**

1. Camouflage in insects.
2. Hibernation in amphibians.
3. Aestivation in rodents.

4. A totally submerged aquatic plant.
5. A desert plant that its leaves are modified into spines.
6. A desert plant that its leaves are modified into juicy branches.

## Question 4:

**Give reasons for:**

1. Some animals undergo hibernation.
2. Some species of birds migrate form their original habitates in winter.
3. The presence of air chambers in elodea stem.
4. Camel's fur is distributed at different densities on its body regions.

## Question 5:

**Compare elodea plant to calamagrostis plant with regarding to the following:**

The environment - roots - leaves - stem.

## Question 6:

Mention three features of adaptation in the camel.

### Self reflection and self evaluation

Dear student. After you have finished the studying of the adaptation and continuity of life, fill in the following card:

A. What are the items you like in this lesson?

.....

B. What are the items you dislike in this lesson?

.....

# Unit 3: General Exercises

## Question 1:

**Choose the correct answer:**

1. ..... and ..... are examples for micro organisms that live in water.
2. The number of jerboa's upper jaw incisors is ..... and their number in the rabbit's upper jaw is .....
3. Armadillo belongs to ..... mammals and the hedgehog belongs to ..... mammals.
4. Camel's blood temperature changes from ..... ºC in early morning into ..... ºC during daylight hours.
5. ..... is from the plants that reproduce by the formation of spores whereas ..... is from the plants that produce seeds inside cones.

## Question 2:

**Choose the correct answer:**

1. The number of the anterior fingers in a hawk is .....
   (3 - 4 - 2 - 1 finger).
2. ..... belongs to the animals with no body support.
   (Octopus - Mussel - Hedgehog - Snake).
3. Camel can survive without drinking water for .....
   (3 days - 3 weeks - 3 months - a week or more).
4. Pea plant belongs to ..... plants.
   (fern - monocotyledon - dicotyledon - gymnosperm).
5. ..... is from the rodents that undergo aestivation.
   (Rat - squirrel - Jerboa - Desert snail).

## Question 3:

**Give one difference between each of the following:**

1. Insects and arachnids.
2. Rodents and lagomorphs.
3. Beans plant and maize plant.

## Question 4:

**Give reasons for:**

1. The individuals of the same species differ in some external characteristics.
2. Camel is considered as a desert ship.

## Question 5:

**What do you expect in each of the following cases:**

1. Polar bear can't undergo hibernation.
2. The aestivated animals don't store their food in the form of fats.
3. The beaks of a hoopoe and a hawk are mutually exchanged.
4. Predatory plants can't capture insects for a long period of time.

## Question 6:

**Give an example to show the adaptation of the following living organisms with the environmental conditions:**

- Duck.
- Heron.
- Hedgehog.
- Dieonea plant.

## Question 7:

**What are the results based on the followings?**

1. The variety of the ways of motion in mammals.
2. Increasing the well known species of living organisms.

# Revision

## First Term General Revision

# Exercise 1

## Question 1:

**Complete the following sentences:**

1. Electric wires are made up of ..... or .....
2. An object potential energy increases ..... of its weight.
3. If the speed of an object motion increases into the double, its kinetic energy increases into .....
4. Bridges made up of iron are coated in the purporse of protecting them from .....
5. The cockroach belongs to ..... whereas the scorpion belongs to ..... and they are classified as ..... animals.
6. When you examine a pond water drop by a microscope, some micro-organisms can be seen such as ..... and .....
7. ..... energy is changed into electric energy in the battery.
8. Energy is the ability to exert .....
9. Sodium symbol is ..... whereas sulphur symbol is .....

## Question 2:

**Choose the correct answer to complete the following sentences:**

1. Cycas belongs to .....
   A. brown algae. B. mosses.
   C. mollusks. D. gymnosperms.
2. ..... is known as the number of protons and neutrons existed in an atom nucleus of an element.
   A. Mass number. B. Density.
   C. Atomic number. D. Valence.

3. In rodents, the incisors number in the lower jaw are .....
   A. one pair.
   B. two pairs.
   C. three pairs.
   D. none.
4. An atom third level is saturated with ..... electrons.
   A. two.
   B. eight.
   C. eighteen.
   D. thirty two.
5. An object potential energy is zero when the object is at the .....
   A. maximum height.
   B. earth's surface.
   C. when the object mass increases.
   D. when the object speed increases.
6. Opuntia plant stores water in its .....
   A. leaves.
   B. roots.
   C. stem.
   D. fruits.
7. The atom nucleus contains .....
   A. protons and neutrons.
   B. protons and electrons.
   C. neutrons and electrons.
   D. protons, neutrons and electrons.
8. The leaves of the aquatic submerged plants are .....
   A. neckless and small.
   B. necked and long.
   C. large - sized.
   D. necked and small.
9. Silver is symbolized by .....
   A. Hg
   B. Au
   C. Cu
   D. Ag

## Question 3:

**Write the scientific term that indicates each of the following sentences:**

1. The ability to exert work.
2. A set of similar animals in their shape and can get intermated together to produce fertile individuals.
3. The simulation of some living organisms to the dominant natural conditions in their environment.
4. The total number of protons and neutrons inside the atom nucleus.
5. The amount of energy which an electron loses or gains to transfer from an energy level into another one.
6. The simplest pure form of a matter which can't be analyzed simpler.
7. The smallest part of matter which can be existed in a solitary form having the properties of matter.

## Question 4:

**Give reasons for:**

1. The bike tire gets hot once you press the brakes.
2. It's favorable to produce electricity from solar energy than fuel burning.
3. The atom is electrically neutral.
4. The two forelimbs in the dolphin are different from the bat's ones although they are structured with similar bones.
5. A camel hump is considered a feature of its adaptation for survival in desert.
6. Cooking pots are made up of aluminum whereas their hand grip are made up of wood or plastic.

## Question 5:

**Show the difference between each of the following:**

1. The element and compound.
2. Beans and wheat.

## Question 6:

Your classmate has seen a bird. He doesn't know this bird's name but he has managed to describe it as a bird with a sharp beak and the legs end in fingers with strong claws.

According to your classmate story. Answer the following question.

1. What is the type of adaptation in both the beak and legs of this bird?
2. How many toes are in each leg?
3. What type of food does this bird feed on?

## Question 7:

«Migration is a form of bird's adaptation»

1. Why do some kinds of birds migrate?
2. What is the type of this adaptation?
3. Give an example of a bird that travels a cross Egypt in its annual journey.

## Question 8:

«Technological applications of energy transformations have benefits and harms».

Explain this sentence and give examples.

# Exercise 2

## Question one :

**Write the scientific term that indicates each of the following sentences:**

1. Mass of unit volume of a substance.
2. Temperature at which liquid state starts to change into gaseous one.
3. Energy stored in an object due to work done on.
4. The simplest from of matter which can not be decomposed into a simpler one by chemical means.
5. Number of positive protons exists inside the nucleus of atom.

## Question Two :

**Give reasons :**

1. Stem of an Elodea plant does not tear by the effect of water currents .
2. An iron nail sinks while one kilogram of cork floats.
3. Elements differ from one another in chemical activity.
4. Snakes secreting poison is considered as functional adaptation while horse hoof is as structural adaptation .
5. Technology has negative effects.
6. A camel legs has flat pad.
7. Spider is not from insects.
8. The kinetic energy of moving object increases by the increases of its mass .
9. Some birds have wide indented beaks in the two sides.

## Question Three :

**Choose the correct answer:**

1. Negative charged particles of negligible mass……
   a- neutrons b- protons c- electrons
2. The number of energy levels in the largest known atom is……
   a- 9 b- 7 c- 5
3. Sum of the number of protons and number of the neutrons in the nucleus of atom is called……
   a- mass number b- atomic number c- atomic mass
4. From animals with internal support……..
   a-Octopus b – fish c-snails
5. From myriapods arthropods……
   a- spider b- Julius c- scorpion
6. From gymnosperms plants……..
   a- wheat b- pine plant c- maize

7. From animals with soft bodies.....
   a- snails b- shrimp c- jelly fish

## Question four :

**Give short account for;**

1. Factors affecting the potential energy.
2. Electric conduction of matter.
3. Ways of heat transfer.
4. Adaptation of insectivorous plants .

## Question five :

**What is meant by..... ?**

1. Species.
2. Adaptation.
3. Birds migration.

## Question six :

**Compare between each two of the following:**

1. Rodents and lagomorphs.
2. Insects and spiders.
3. Hibernation and aestivation.

## Question seven :

**Put (√ ) in front of the correct statements and ( X) in front of the wrong ones :**

1. Potential energy decreases by the increase of height at which the object reaches. ( )
2. Melting point is the temperature at which matter changes from a solid phase into a liquid one. ( )
3. Molecule is the smallest part in a matter that can exist freely and appears in it the matter properties. ( )
4. Animals can be classified according to the body support. ( )

# Exercise 3

## Question one :

**Complete the following statements:**

1. Unit of volume is..... and that of mass is .....
2. An alloy of ..... is used in making jewels while an alloy of ..... is used in making heaters coils.
3. Some solutions are good conductor of heat and electricity as ..... and ..... , while some solutions which do not conduct neither heat nor electricity like.....

4. Electrons are particles with .....charges while protons are particles with ..... charges.
5. Liquid element its molecule consists of one atom is..... while that its molecule consists of two atoms is.....
6. The melting point is the temperature at which matter changes from a ..... state into a ..... one.
7. 2nd level ( L) is saturated by ..... electrons while 4th level (N) is saturated by ..... electrons .
8. When a body is raised up ,the potential energy.....while the kinetic energy.....
9. The kinetic energy of a body depends on .....and.....
10. Mechanical energy = ..... +.....
11. In photosynthesis process the..... energy converts into..... energy
12. In the electric heater wire the .....energy converts into ..... energy
13. Mass number is the sum of .....number and ..... number inside the nucleus of element.
14. The positive pole in simple electric cell is .....while the negative pole is..... .
15. Hawks have .....beaks while ducks have..... beaks .
16. The front limbs of whale are modified into.....
17. From plants that reproduce by spores.....and from plants that produce seeds inside cones.....
18. From teethless mammals .....and.....
19. Cockroach is considered from .....and scorpion is from.....
20. In winter, frogs hide in burrows and that is called.....while in summer jerboa hides in humid burrows and that is called.....
21. Types of adaptation are structural,..... and.....

## Question two:

**Write the scientific term:**

1. Mass of unit volume of a substance .
2. It is the temperature at which a substance changes from a solid state into a liquid one.
3. The number of positive protons inside the nucleus of atom
4. The amount of energy gained or lost for the electron to transfer from an energy level to another.
5. The simplest pure form of a matter which can't be analyzed simpler.
6. Ability to do work or cause change .

7. One of the energy forms transfers from higher temperature to lower temperature
8. Energy stored in an object due to the work done on during motion.
9. The work done during the motion of an object .
10. The basic classification unit for living organisms.
11. A modification in behavior, structure or the biological function of a living organisms organs become more adapted with the environmental conditions where it lives.
12. The ability of some living organisms to simulate the dominant environmental conditions to be hidden from their enemies or even to capture the preys .

## Question Three:

**Give reasons for:**

1. Wood piece floats in water while another made up of iron sinks.
2. Water does not use in putting off petroleum fire.
3. Painting metallic bridges and the holders of light bulbs in streets from time to time.
4. Cooking pots have handles made up of wood and plastic.
5. Atom is electrically natural.
6. Level ( K) is saturated by electron before level ( L).
7. There are air chambers in the stem of elodea plant.
8. Some plants pounce and predate insects.
9. Quail bird is a good example for adaptation to the environmental conditions.
10. Camel is called the desert ship.
11. The camel limbs ends in a flat pad and thick skin.
12. Camel eye has plenty of lachrymal glands and two rows of long lashes.
13. The thickness of camel's fur at different body region.

## Question four:

**What happens in each of the following cases?**

1. Leaving a piece of iron exposed to moist air for a period of time.
2. When the energy of the electron is larger than the energy level in which the electron rotates.
3. Friction of the bicycle wheels to rough surface.
4. No aestivation occurs to jerboa.
5. Camel exchanges its pad with a horse 's hoof.
6. Absence of air chambers in the stem of elodea plant.
7. If the polar bear could not hibernate.
8. Increasing the body temperatwre of camel to 40°C

## Question five:

**Choose the correct answer:**

1. From substances that float on the surface of water is.....
   a- iron b- copper c- cork
2. A piece of metal its mass is 25 gm and its volume is $10cm^3$ when it placed in water it will..... ( water density $1gm/cm^3$)
   a- float b- sink c- suspended
3. The volume of liquid is calculated as this relation.....
   a- $\frac{mass}{density}$ b- $\frac{density}{mass}$ c- mass × density
4. Density of red copper is $8.8\ gm/cm^3$ means.....
   a-The mass of the volume unit $1cm^3$ of red copper equals 8.8gm.
   b- The mass of the volume unit $1cm^3$ of red copper not equals 8.8gm.
   c- The mass of the volume unit for $10cm^3$ of red copper equals 8.8gm
5. From inert gases .....
   a. Nitrogen b. Helium c. Oxygen
6. Balloons of festivals filled with Helium rise upwards due to the
   a. density of Helium is less than density of air
   b. density of Helium equals to density of air
   c. density of Helium is greater than density of air
7. Water molecule is consisted of.....
   a. two hydrogen atoms and one oxygen atom
   b. hydrogen atom and two oxygen atoms
   c. hydrogen atom and oxygen atom
8. The number of energy level in the heaviest atom is .....
   a. 7 b. 8 c.32
9. The matter which does not take the shape of the container is
   a. solid b. liquid c. gaseous
10. Attraction force between solid molecules is .....
    a. large b. small c. very small
11. When the atomic number for element equals to its mass number that means there is no ..... in the nucleus of that element
    a. electrons b. protons c. neutrons
12. Potential energy equals.....
    a. weight × height . b. mass × height . c. weight × speed.
13. Weight of the body on earth equals its .....
    a. mass + gravity acceleration. b. mass × gravity acceleration.
    c. mass ÷ gravity acceleration.

14. Heat transfers by radiation occurs through.....
a. only liquids b. only gases
c. material mediums and nonmaterial mediums

15. From animals which have no body support.....
a. reptiles b. snails c. jelly fish

16. Camel can live without water for .....
a. a year b. 3 days c. week or more

## Question six

**Identify:**

1. Matter
2. Melting point
3. Boiling point
4. Atom
5. Atomic number
6. The compound
7. Law of energy conservation
8. Adaptation

## Question seven:

**Put ( √ ) in front of the correct statement and ( × ) in front the wrong one with correcting it;**

1. Density of matter = mass × volume . ( )
2. Iron rusts when exposed to dry air . ( )
3. Liquid substance has definite shape and volume. ( )
4. Molecules consist of atoms . ( )
5. Mercury is from solid metals . ( )
6. Wood and plastic are from poor conductors of heat. ( )
7. Methods of heat transferring in different media are by conduction and convection only. ( )
8. Cold air rises up, while hot air fall down . ( )
9. The bird activity during the day and the bat during night is from functional adaptation. ( )
10. Roots of desert plants extend near the surface of the soil or depths the soil. ( )
11. Human belongs to one species whatever his color or race or home. ( )

## Question eight:

**Mention one example for:**

1. A good conductor matter for heat and electricity.
2. An inert gas.

3. A plant from ferns.
4. A submerged plant.
5. A vertebrate animal.

## Question nine:

**State one difference between:**

1. Element and compound
2. Bean and wheat
3. insects and spiders
4. Elodea plant and Calamagrostis plant in view of : evidences for adaptation of their roots.

## Question ten:

**Different questions:**

**1. Write down the electronic configuration of the following atoms:**

$_{11}Na$ $_{12}Mg$ $_{17}Cl$ $_{2}He$

**2. Compare between the solid, liquid and gaseous matter with regarding to :**

- Intermolecular spaces among molecules.
- Attraction forces between molecules.
- Motion of molecules.

**3. " Each modification is for specific function"**

What is the function of each of the following?

- Tail fin of fish.
- Long arms of monkey.
- Wings of bat.
- Paddles of whales and dolphins.
- Front teeth of hedgehog.
- Wide indented beak of duck
- Sharp and strong claws able for bending of vulture
- Sharp crooked beak of hawk
- Dense hair inside the ear of camel
- Opening and closing camel's nostrils
- Spine needle leaves in cactus

**4. Mention the formula by which you can :**

a- Calculate the density

b-Calculate the number of electrons in each energy level

**5. Explain an activity to show the following:**

How to make a model for simple electric cell ?

**6. What are the results based on the following.....?**

a- Stick insect looks like the branches of plants

b- Camel's blood temperature is not constant

c- Diversity in having food for birds

d- Living of mammals in varied environment

**7. Cross out the unsuitable word and then write down what expresses the rest words:**

a- petroleum- wood – cork – iron.

b- lion- tiger – dog – wolf – armadillo.

c- hibernation – extinction – aestivation – camouflage.

d- bean – pea- maize – pine – wheat.

## Question eleven:

**Problems**

1. On determining iron density using a piece of iron of mass 78 g.

   The piece is immersed in 100 $cm^3$ of water, the water increases up to 110 $cm^3$ .Calculate iron density.

2. In an experiment to determine water density, following results are recorded:

   Mass of an empty glass beaker =65 g

   Mass of the beaker containing liquid = 165 g

   Volume of the liquid measured by a graduated cylinder = 100 $cm^3$

   Calculate water density

3. Calculate the mechanical energy for a moving body if you know that its kinetic energy is 1000 joule and its potential energy is 500 joule.

4. Calculate:

   a- Potential energy of an object is 10 N weight ,placed at 5 m height from ground

   b- Kinetic energy of an object its mass is 2kg and moving at a speed of 5m/s

5. Calculate the weight of an object its mass is 5kg if you know that the gravity of acceleration is $9.8 m/s^2$
6. Calculate the potential energy of an object its weight is 20 N, placed at 5m height from ground.

## Question twelve:

**a-Choose from B and C what suits from A**

| A | B | C |
|---|---|---|
| - Tiger<br>- Frog<br>- Ameaba<br>- Microscope<br>- Goose<br>- Bat<br>- Drosera<br>- Stick<br>- Scorpion | -An instrument used<br>-Predator bird<br>-From arachnids<br>-Insect<br>-Bird swims in water<br>-An instrument used to examine<br>-Unicellular organism<br>-Amphibian<br>-Mammal animal<br>-Predacious plant<br>-Desert plant<br>-Behavioral adaptation<br>-From mammals | Lives in shallow water<br>Has wings to fly<br>Has wide indented beak<br>Feeds on insects<br>Has sharp strong crooked beak<br>For distant vision<br>Has three pairs of legs<br>Aestivation<br>Example for hibernation<br>Contents of drop of shallow water<br>Good example for hiding<br>Has pointed canine and molars with sharp projections<br>Has four pairs of leg |

**b- Choose from B what suits from A and rewrite the complete statement:**

| A | B |
|---|---|
| 1-Elodea plant<br>2-Opuntia plant<br>3-Calamagrostis plant<br>4-Cactus plant | 1-Its leaves are modified into spines<br>2-Its leaves are used to store water<br>3-Its leaves are ribbon like and spiraled<br>4-Its leaves are sessile ribbon<br>5-Its leaves are weak short |

# Test 1

## Question one:

**Complete the following statements:**

1. Camel limbs end in.....while horse limbs end in.....
2. Mass number is the sum of ..... and ..... found in the nucleus of the element.
3. Potential energy increases by increasing.....and.....
4. From plants which reproduce by spores.....and from plants which produce seeds inside cones.....

## Question Two:

**A- Write the scientific term that indicates each of the following sentences:**

1. Temperature at which solid state starts to change into liquid one.
2. The ability to exert work.
3. The amount of energy which an electron loses or gains to transfer from an energy level into another one.
4. The ability of some living organisms to simulate the dominant natural conditions in their environment.

**B- Compare between**

Element and compound

Water and ice with regarding to the intermolecular spaces.

## Question Three:

**A-Give reasons for**

1. Some plants pounce and predate insects
2. Atom is electrically natural
3. There are front teeth extending outwards in hedgehog
4. Differences between matter molecules from one another in their properties

**B- An element its atomic number is 11 and its mass number is 23 , illustrate the electronic configuration in the energy levels of that element.**

## Question Four:

**A- Rewrite the following statements after correcting the under line words:**

1. Gaseous matter keeps its shape and volume whatever the container changes.
2. Bean plant is considered from monocotyledon.
3. The chemical symbol of sulphur is C

**B- Find the potential energy of an object its mass is 5kg when found at a height 10 m from ground, consider gravity acceleration = 10 $m/s^2$**

# Test 2

## Question one:

**Complete the following statements:**

1. Matter is composed of small units called .....while these units are composed of smaller units called.....
2. Electrons are particles with .....charges while protons are particles with..... charges .
3. Hawks have ..... beaks, whereas duck's beak .....

4. An alloy of ..... is used in making jewels while an alloy of ..... is used in making heaters coils.
5. If the potential energy of an object is 100 Joule and its kinetic energy 50 joule ,it has mechanical energy equals..... joule.

## Question Two:

**Give reasons for:**

1. Atoms of some gases as of the inert gases do not react chemically
2. Camel limbs ends in a flat thick pad
3. Some animals undergo aestivation

**B- In an experiment to determine water density, following results are recorded:**

Mass of an empty glass beaker =56 g

Mass of the beaker containing liquid = 156 g

Volume of the liquid measured by a graduated cylinder = 100 $cm^3$

Calculate water density

## Question Three:

**Write the scientific term for the following sentences:**

1. The number of the negative charge electrons revolve around the nucleus in energy levels
2. A modification in behavior, structure or the biological function of a living organisms organs become more adjustable with the environmental conditions where it lives
3. Imaginary places around the nucleus in which the electrons move according to their energy.
4. The product results from a combination between two or more atoms of different elements with constant ratios of mass

## Question Four:

**Put ( √ ) in front of the correct statement and ( x ) in front of the wrong ones and correct the incorrect ones:-**

1. Intermolecular spaces are tiny in solids ( )
2. Insectivorous plants can not absorb nitrogenous substances required to form fats ( )
3. All mammals walk on four limbs ( )
4. Neutrons are found inside the nucleus and carry positive charges ( )
5. Opuntia plant has weak roots for no need to fix the plant in the soil ( )